IMPROVING THE SMALL BUSINESS INNOVATION RESEARCH AND SMALL BUSINESS TECHNOLOGY TRANSFER PROGRAMS

JOINT HEARING

BEFORE THE

SUBCOMMITTEE ON CONTRACTING AND WORKFORCE

OF THE

COMMITTEE ON SMALL BUSINESS

AND THE

SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY

OF THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

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IMPROVING THE SMALL BUSINESS INNOVATION RESEARCH AND SMALL BUSINESS TECHNOLOGY TRANSFER PROGRAMS

THURSDAY, MAY 4, 2017

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SMALL BUSINESS,
SUBCOMMITTEE ON CONTRACTING AND WORKFORCE,
JOINT WITH THE
SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, DC.

The Subcommittees met, pursuant to call, at 10:02 a.m., in Room 2318, Rayburn House Office Building, Hon. Steve Knight [chairman of the Subcommittee on Contracting and Workforce] presiding.

Present from Subcommittee on Contracting and Workforce: Representatives Knight, Estes, Chabot, Murphy, Clarke, Evans, and Lawson.

Present from Subcommittee on Research and Technology: Representatives Comstock, Marshall, Lipinski, and Tonko.

Chairman KNIGHT. Good morning. Thank you all for coming. This is a bit of a historic moment, the first time in a long time that the Small Business and the Science, Space, and Technology Committees are having a joint hearing. And I think that that is something that we can all be proud of, that we are working together.

That being said, we are only going to work together for a few minutes, and then we are going to go down and vote. And hopefully we will work together there and come back and keep this moving.

But I think what we will do is we will do as much of our opening comments as we can and maybe put a bookmark there before we get to witness statements. And I don't know if we are going to have any stop there.

So with that being said, good morning, and thank you all for being here to examine Small Business Innovation Research and Small Business Technology Transfer, or SBIR/STTR, programs.

Innovation is the engine to our economy. You are going to hear me say that probably every hearing that I chair, and I think we firmly believe that. Technological breakthroughs and the entrepreneurship it spurs builds our economy by finding state-of-the-art solutions to difficult problems and capitalizing on those new products.

This correlation is particularly important in the small-business arena. Small businesses tend to be more nimble, responding to

market changes more rapidly than their bigger counterparts. They drive innovation. They make us more agile in the world economy.

In this era of globalization, making it easier for small businesses to develop and commercialize new, innovative products is essential not only for America's competitiveness, but for our national security as well.

This is why we need programs like SBIR and STTR programs. These programs, envied and emulated across the world, were created based on the premise that small technological-based firms tend to be highly innovative and inventive and that this innovation should be better harnessed by the Federal Government.

Binding these new developed technologies with our Federal R&D efforts was seen as a natural extension to both boost small-business participation in Federal R&D activities and to solve agency institutional problems at the Department of Defense, National Institutes of Health, or the Department of Energy.

All too often, good ideas never materialize because of a myriad of obstacles. I think we can say that. It could be lack of funding, lack of understanding, or a perceived lack of a marketplace for a truly new and amazing technology. And I can say that every one of us on this dais has been to small businesses and seen great activity and great innovation.

The SBIR and STTR programs bridge the gap between fantastical and the practical, building our economy and improving the function of the Federal Government in the process.

Over the past few years I have had the opportunity to meet some of the entrepreneurs who participate in these programs, and I have seen some of the truly groundbreaking technologies they have produced. By visiting small businesses around my district and attending some of the national SBIR/STTR conferences here in Washington, I have been impressed at how technical and pioneering these technologies can be. The small businesses that participate in these programs are truly and rapidly pushing the boundaries of what is possible in a variety of fields.

Last year, our two Committees worked with the House and Senate Armed Services Committee to include a 5-year extension of the SBIR/STTR programs. This provided small businesses and the participating agency alike with the confidence and security to know that those popular programs will continue to be there at least through 2022. This year, both our Committees are interested in collaborating on legislation making minor adjustments and improvements to the programs.

Today, we have two excellent panels of witnesses to discuss these programs and provide the Subcommittees with suggestions as to how to make them superior for small businesses and participating agencies alike. I am looking forward to hearing those ideas and working with my colleagues on both Committees to draft legislation we will all be proud of.

Again, I want to thank you all for being here. I now yield to the ranking member for the Subcommittee on Contracting and Workforce, Mrs. Murphy of Florida, for her opening remarks.

Mrs. MURPHY. Thank you all for being here.

And thank you, Mr. Chairman.

The Small Business Innovation Research program, or SBIR, and the Small Business Technology Transfer program, or STTR, were established to spur innovation and job creation throughout the country. Since their inception, these programs have awarded over $40 billion to small innovative firms. Today, SBIR is one of the Federal Government's largest technology development programs.

Research conducted by SBIR and STTR awardees has helped to address our country's most important research and development challenges. As a direct result of these programs, breakthroughs have been made in a wide range of sectors; in agriculture, in energy, and most notably in health care.

These discoveries, in turn, have generated tremendous economic growth and employment opportunities. For example, in fiscal year 2013, my home State of Florida received 107 SBIR awards totaling $49 million, the 10th most among all participating States and territories.

Florida also received 24 STTR awards, totaling nearly $9 million, which placed it sixth among participating jurisdictions. As reported publicly, there have been at least 40 awards made to firms in central Florida in 2016 and to date in 2017. For many research companies in my district, these two programs serve as a gateway to the Federal contracting field.

The continued success of the SBIR and STTR programs depend upon three primary factors. First, the program must remain highly competitive. Second, applicants and awardees must have access to the financing of all types, including venture capital. And third, we must ensure these products make it to market.

The current administrative fee authorization for these programs will expire in September 2017, but the full program was granted a 5-year extension in the 2017 NDAA. While the Committee has seen these programs succeed as a result of legislative updates made in 2011, there are still various areas of concern that require examination.

One of the primary outcomes of the 2011 legislation was a greater focus on commercialization through sequential Phase II awards. This was necessary to ensure that the program remains a catalyst for innovation and job creation associated with these scientific advances.

During today's hearing, I look forward to learning more about how the reauthorization's various commercialization initiatives have played out in Florida and nationwide and if they are, in fact, resulting in more successful endeavors.

Among other notable changes in 2011 were increases in permissible award sizes and a Phase 0 proof of concept partnership pilot program at NIH. I hope today's hearing sheds light on the success of these provisions. I am particularly interested in the pilot program given the presence of the University of Central Florida in my district.

While the 2011 reauthorization made several modifications to further assist small firms, the needs of innovative companies have evolved and so too must these programs. Two issues continue to raise concerns.

First, the programs remain concentrated in just a few States. Indeed, the top 10 awardee States receive over half of the number of

awards and half of the dollars. Specifically, 52 percent of award dollars for SBIR and 62 percent of award dollars for STTR in fiscal year 2013.

Second, the participation of women-owned and minority-owned firms in these programs has been declining. According to SBA's SBIR annual report for fiscal year 2013, 15 percent of total award dollars went to women-owned small businesses, 6 percent to socially or economically disadvantaged-owned small businesses, and 4 percent to hub zone-certified small businesses.

I look forward to a frank discussion about the 2011 changes and the opportunity for additional program improvements. It is clear that the SBIR and STTR programs have promoted our shared goal of fostering innovation, but we must continue to provide vigilant oversight of these programs to ensure their maximum effectiveness.

I thank the witnesses for being here today and express my gratitude to the Chairman for calling this joint hearing with our colleagues from the Science Committee.

Thank you, and I yield back.

Chairman KNIGHT. Thank you, Mrs. Murphy.

I now yield to the gentlelady from Virginia, the Chairwoman of the Subcommittee on Research and Technology, Mrs. Comstock.

Chairwoman COMSTOCK. Thank you, Mr. Chairman.

America's future economic and national security depends on global leadership in key areas of science and technology. Basic research supported with taxpayer dollars through the National Science Foundation, NASA, NIH, DOD, and other Federal agencies underpins the key scientific discoveries that have created today's world: the internet, wireless communications, lifesaving medicines, lasers, and more.

At the horizons of basic research are breakthroughs in new fields like quantum computing, artificial intelligence, and bioengineering, breakthroughs that will continue to transform our lives and the world we live in.

If basic research produces the scientific feedstock for innovation, risk-taking small businesses are the catalyst for converting knowledge into new products and services. They are the catalyst for economic growth, for producing the family- and community-sustaining jobs that we need so badly.

Congress enacted the Small Business Innovation Research, or SBIR, program in 1982, followed by the Small Business Technology Transfer, or STTR, program in 1992. These two programs accelerate technological innovation and commercialization of new products and services by small businesses. They also help DOD and other agencies meet their research and development needs.

Federal agencies with extramural research budgets of $100 million or more per year offer assistance through the SBIR program. They are required to allocate just 3.2 percent of their extramural research budgets for competitive grants to small businesses, grants that underwrite the businesses' technology development and commercialization initiatives.

The five Federal agencies with extramural research budgets of at least $1 billion or more per year comprise the STTR program. These agencies allocate an additional 0.45 percent of their budgets for STTR grants. Although these sound like small percentages—

and they are—the total dollar numbers are huge. Since Congress first authorized these programs, participating Federal agencies have awarded more than $40 billion to small businesses.

This is a huge cumulative taxpayer investment. And this continuing investment in the program's potential to stimulate needed economic growth makes it particularly important for Congress to ensure the programs are being administered efficiently and effectively.

There are many small business success stories in which SBIR and STTR assistance have played a key part. Among the thousands of small companies and start-ups that have used SBIR and STTR to bootstrap their growth are dozens in my Northern Virginia district.

These include 3 Phoenix, an engineering small business in Chantilly, Virginia, that uses SBIR assistance to create innovative electronic technology solutions to the Department of Defense and the U.S. Navy, as well as private industry. The CEO of 3 Phoenix, Inc., testified before our Subcommittee last year.

Mosaic ATM, a Leesburg enterprise, has used SBIR to improve air transportation efficiency and safety and push the envelope on unmanned aircraft systems.

And Vidrio Technologies, an Ashburn small business, is commercializing neuro-imaging tools and microscopes to provide a better "window into the brain."

These and other businesses, both in our region and throughout the country, are the people who will be able to really hit those cutting-edge technologies and grow jobs in this important space. I look forward to hearing your testimony today.

Chairman KNIGHT. I thank the Chairwoman.

Chairwoman COMSTOCK. Oh, I am sorry. If I might, I did want to mention also Progeny Systems of Manassas and Aurora Flight Sciences of Manassas, Virginia. I did run out of time, but in case you are here, those are a couple of others. So, my apologies.

Chairman KNIGHT. Thank you very much.

And I now yield to the gentleman from Illinois, the Ranking Member of the Subcommittee on Research and Technology, Mr. Lipinski.

Mr. LIPINSKI. Thank you, Chairman. And I want to thank you, Chairwoman Comstock, and Ranking Member Murphy for holding this hearing to consider improvements to SBIR and STTR programs that help small-business innovators turn their ideas into market-ready products.

While we need to support strong investment in basic research at our Nation's universities and Federal labs, we should also support innovative and scalable policies and programs to help move this taxpayer-funded research out of the lab for commercial and societal you all benefit.

The SBIR and STTR programs engage innovative small businesses in the Federal R&D system and play an important role in technology transfer. We need to do what we can to make these programs work even better, because America's economic development and job growth depend on these small-business innovators.

Eleven Federal agencies invest a total of $2 billion annually in SBIR and STTR programs. These programs are a critical source of

early-stage R&D financing. They give small businesses access to nondilutive capital for validation of their ideas, product development, and testing, which often leads to follow-on private sector funding and market introduction.

Commercialization is one of the ultimate objectives of the SBIR program. In last year's assessment of the SBIR and STTR programs, the National Academy of Sciences found that about half of all the programs' awardees generated commercial sales. And in a survey of NIH awardees, about 27 percent of the respondents had sales in excess of $1 million.

SBIR is funded as a carveout from funding for basic research, including research carried out by many of the same innovators who eventually apply for SBIR funding. Unfortunately, for the most part, the overall pot of research money is not growing, even as the SBIR program has grown by 30 percent since 2011.

We must continue to be sensitive to this balance between funding for the pipeline of talent and basic research that feeds the idea that an entrepreneur may eventually commercialize and funding directly to entrepreneurial activity itself.

Recent assessments of the SBIR program have provided us with good ideas on how to make the program more efficient and better able to achieve this goal of commercializing new products and services. A great proven example of this is the Innovation Corps program, also own as I-Corps. I-Corps provides entrepreneurial education and other early-stage support for innovators.

NSF launched I-Corps in 2011 and it has since spread to other agencies, including DOE, NIH, DOD, USDA, and others. Early returns show that entrepreneurs who go through this program are more successful in their SBIR applications than those who do not.

I-Corps and SBIR go hand in hand to strengthen the Federal R&D ecosystem that connects research institutions and industry. I believe we need to expand on the success of I-Corps by making entrepreneurial education a central pillar of the SBIR program. We need to expand access to I-Corps so it is available to SBIR grantees from every agency. We also need to spread the I-Corps model of entrepreneurial education throughout all phases of the SBIR cycle.

Just as participating in I-Corps prior to applying for a Phase I grant can increase a researcher's success rate, participating in a startup accelerator that mentors innovators and teaches them how to scale their companies can increase their chances of commercial success.

There are many examples of successful accelerators already operating, such as Y Combinator in Silicon Valley or the New Venture Challenge at the University of Chicago. The SBIR program should adopt a proven accelerator model for Phase II grantees.

In addition to entrepreneurial education, innovators often need funding for proof-of-concept work prior to applying for an SBIR grant. In the 2011 SBIR reauthorization, I sponsored a provision to create a Phase 0 pilot program at the NIH. The Phase 0 proof-of-concept partnership pilot program utilizes a small portion of the funds from within STTR. The NIH Centers for Accelerated Innovations and Research Evaluation and Commercialization Hubs, or REACH, are funded by this pilot program. I look forward to hear-

ing from Dr. Rubin about the REACH Center that he directs at Stony Brook University.

Relatively small investments by agencies in all aspects of pre-SBIR education and innovation could significantly improve commercialization outcomes for the SBIR program and for federally funded research more broadly.

Beyond commercialization, there are several other significant issues that I know our Federal witnesses will address this morning. We will hear from Mr. Neumann about ways to better guard against fraud, waste, and abuse in the SBIR program.

The 2011 SBIR authorization included provisions to improve agencies' flexibility in making awards to small businesses, provide funding for outreach activities and other administrative issues, and increase data reporting. I look forward to an update from Mr. Shepard on how the agencies have implemented these new requirements, as well as feedback from the small-business witnesses on what they believe has worked and what still needs improvement.

Your testimony is important and helps us determine what to address as we work on additional policy improvements for the SBIR program. I look forward to working with my colleagues in both Committees to continue updating and strengthening the SBIR and STTR programs.

And I yield back the balance of my time.

Chairman KNIGHT. I thank the gentleman.

Okay. If Committee members have an opening statement prepared, I ask that they be submitted for the record.

I would like to take a moment to explain the timing lights for you. You have 5 minutes. We like to keep you two as close to 5 minutes as we can. We will be very flexible. But as the light starts to get going on the yellow light, you have a minute left, and as the red light comes, you stop. We will give you a little bit of flexibility there, but please try and keep it as close as you can.

We are going to keep moving, because they are keeping on moving on the floor. So our first witness is Mr. Joe Shepard, Associate Administrator of the Office of Investment and Innovation at the SBA. Prior to his appointment, Mr. Shepard was most recently a partner and managing director of the Archway Capital Management and was previously a director of Bank One Capital Markets, the investment banking and private equity bank group of Bank One Corporation, now JPMorgan.

In both positions, he was responsible for evaluating and processing direct equity and mezzanine investments, as well as providing merger, acquisition, advisory, and investment banking services. In addition to his private sector accomplishments, Mr. Shepard is beginning his second stint with the SBA, as he was previously the associate administrator for investment from 2007 to 2009.

Thank you for your participation today, Mr. Shepard. I am going to get through both, and then we will start back.

Our second witness is Mr. John Neumann, Director of Natural Resources and Environment at the United States Government Accountability Office, or GAO. He has 25 years of experience with the GAO and currently manages a diverse portfolio of audits in science

and technology, food safety, and agriculture areas in the Natural Resources and Environment team.

Other areas of his expertise include defense industrial base and government-wide contracting issues. He has produced a range of reports and testimonies on topics such as federally funded research and development centers, defense supply chain, protection of critical technologies, and, of course, the SBIR and STTR programs.

We thank you, Mr. Neumann, for testifying today.

And we are going to go back to Mr. Shepard, and you have 5 minutes, and we welcome your comments.

STATEMENTS OF MR. JOE SHEPARD, ASSOCIATE ADMINISTRATOR, OFFICE OF INVESTMENT AND INNOVATION, UNITED STATES SMALL BUSINESS ADMINISTRATION; AND MR. JOHN NEUMANN, DIRECTOR, NATURAL RESOURCES AND ENVIRONMENT, U.S. GOVERNMENT ACCOUNTABILITY OFFICE

STATEMENT OF JOE SHEPARD

Mr. SHEPARD. Very good. Thank you, sir.

Chairman Knight, Chairwoman Comstock, Ranking Member Murphy, and Ranking Member Lipinski, and other distinguished members of this Committee, thank you for inviting me to be here today to this joint hearing on "Improving the Small Business Innovation Research and Small Business Technology Transfer Programs."

On March 22, 2017, 43 days ago, SBA Administrator Linda McMahon announced my appointment as the SBA's associate administrator for the Office of Investment and Innovation, and I am honored to be at the SBA and honored to be here today with all of you.

The SBA Office of Investment and Innovation, which oversees the SBIR and STTR programs, provides a front row seat to observe the risks and challenges entrepreneurs face in their attempts to bring innovations to the market. As a former investor and intermediary in venture capital and early-stage financings, I have seen these challenges firsthand in the private sector. So I am excited to be part of an agency, to be part of an office that can help make improvements to ease the challenges and increase the likelihood of success for our Nation's innovators.

Since joining SBA, I have started to familiarize myself with SBA's oversight responsibilities for the SBIR/STTR programs, which involve policy, outreach, collection, maintenance, and publication of data, monitoring program implementation, and reporting to Congress, agency improvement suggestions, and coordination of the FAST program.

Like Administrator McMahon, I am committed to improving the effectiveness, efficiency, and accountability of the SBIR and STTR programs. I look forward to with working with Congress, the Federal agencies, and all current SBIR/STTR program participants so that SBA can fulfill its oversight role and improve the programs.

A previous program improvement that has been beneficial to the SBA and the Federal agencies is the 3 percent administrative funding pilot that was introduced in the 2011 authorization. The pilot

has entitled SBA to improve its ability to gather data from the Federal agencies through the SBIR.gov business intelligence platform and to raise program awareness through several outreach activities.

In regards to outreach, SBA seeks to improve participation by women, minorities, and underrepresented communities through SBA's web-based training modules, train-the-trainer programs, and the SBIR Road Tour. Through the SBIR Road Tour, program managers from 11 participating Federal agencies, together with SBA, will have made 53 bus stops in 35 States by the end of 2017. Past and current tours will have engaged over 10,000 innovators from throughout the U.S.

A major partner in SBA's outreach activities and efforts have been universities. More than half of SBA's outreach efforts have occurred in university facilities. SBA is working with NASA on their outreach to Historically Black College and Universities and other minority-serving institutions to raise awareness about the opportunities that exist so that SBIR/STTR programs can be accessed. These programs are an ideal tool for the universities to commercialize their basic science and then transition public investments to the marketplace.

A particular priority for Administrator McMahon and for many members of these respective Committees here today is to ensure that women innovators are aware of and are competing for SBIR/STTR awards. This resonates with me as well, since my wife, her degree and career is in the STEM field. SBA has made increasing the participation of women in SBIR and STTR programs a priority. SBA will continue to coordinate program outreach activities with all 11 Federal agencies.

To conclude, for more than 25 years, these programs have encouraged innovation and entrepreneurial activity in our Nation. Today small businesses, through the current SBIR/STTR programs, continue to be encouraged to develop and commercialize their innovative products.

Also, as a father of an 11-year-old son with an interest and an aptitude in science and technology and engineering and math, I am keenly aware of the importance of these programs for the next generation, the next generation of American entrepreneurs, of small-business owners, and university researchers, who will seek to make meaningful contributions that will help our economy grow and strengthen in the future.

Thank you.

Chairman KNIGHT. Thank you very much, Mr. Shepard.

And we will go to Mr. Neumann.

STATEMENT OF JOHN NEUMANN

Mr. NEUMANN. Chairman Knight, Chairwoman Comstock, Ranking Members Murphy and Lipinski, and members of the Subcommittee, thank you for the opportunity to be here today to discuss our work on the Small Business Innovation Research and Small Business Technology Transfer programs.

As you know, Federal agencies award about $2 billion a year through these small business research programs, and SBA and the

11 participating agencies each play an important role in ensuring that these programs are working efficiently and effectively.

With that goal in mind, over the last 5 years GAO has made a total of 20 recommendations to SBA and the participating agencies. To date, about one-third of those recommendations have been implemented.

Today, I would like to briefly highlight three areas where we have made recommendations to improve the oversight and implementation of the SBIR and STTR programs: reporting requirements, the administrative pilot program, and fraud, waste, and abuse prevention requirements.

Over the last 5 years, we have made a number of recommendations to SBA and the participating agencies to improve their compliance with reporting requirements. For example, SBA is required to report annually to Congress on the agency's compliance with spending and other reporting requirements for the SBIR and STTR programs.

In each of the last 4 years, we found that SBA had not submitted timely reports to Congress. The most recent required report that SBA issued was in March 2016 that covered spending for fiscal year 2013. SBA officials have told us that they have taken some actions to improve the reporting process, but they have yet to submit the required reports to Congress for fiscal years 2014, 2015, or 2016. We believe that providing Congress with timely annual reports will improve oversight of these programs.

We have also made several recommendations to SBA to improve the implementation of the administrative pilot program. In response to one of our recommendations, SBA has taken steps to get better information from the participating agencies on how they use the administrative funds rather than just the total amount they spend on the program.

SBA has yet to implement another recommendation we made to evaluate the potential constraints that have hindered some agencies from participating in the administrative pilot program. SBA's evaluation would be useful if Congress decides to continue the program beyond this fiscal year.

Lastly, we made four recommendations to SBA to improve the implementation of fraud, waste, and abuse prevention requirements for the SBIR and STTR programs.

Agencies that participate in the programs are required to implement certain activities to prevent fraud. For example, agencies are required to list information on their SBIR program websites on successful prosecutions of fraud in the programs.

While SBA has updated its guidance to the agencies in 2012, we have found that they have taken few actions since then to oversee the agencies' implementation of these requirements. We recommended that SBA, in its oversight role for the program, take steps to ensure that agencies are clear on the fraud prevention requirements and are implementing them. In addition, we recommended that SBA evaluate the requirements to determine if they are appropriate and meeting the intended purpose of preventing fraud in these programs.

We look forward to reviewing SBA's progress in implementing these important recommendations.

This concludes my prepared remarks. I am happy to respond to any questions you may have.

Chairman KNIGHT. Thank you very much, Mr. Neumann.

And we will continue on. We are getting very close to voting on the floor, but I think we will continue on and try to get through my questions and maybe the ranking member's.

What we will try to do is keep our questions down to 5 minutes and move this through the panel as quickly as we can, because we would like everyone to be able have a chance to ask questions if they would like to.

So, Mr. Shepard, I will start off. In the past agencies had a less than favorable view of SBIR programs because it was statutorily mandated that no SBIR funds from the allocation could be used to administer the programs, leaving agencies to find the money somewhere else. The 3 percent administrative funding pilot included in the 2011 reauthorization attempts to alleviate those concerns.

Do you feel that by allowing agencies to administer the program with SBIR funds it has perhaps changed the perception of the program and allowed it to grow in popularity within agency circles? And if not, how can we?

Mr. SHEPARD. Thank you for your question, Mr. Chairman.

Absolutely, the administrative funding pilot and the fees, I think the response that I have heard so far from the SBA team is that the different Federal agencies that have that are doing a good job of utilizing that. It has been very helpful for them in terms of their outreach efforts.

And it has been very helpful for the SBA as well in terms of coordinating with them in terms of outreach primarily, and also helping with the flow of data and the communication back and forth in terms of the data-collection effort that is necessary and the timely transmission of that data to SBA.

So I think it has been a very helpful component to the program.

Chairman KNIGHT. Good. I find that many people don't know what SBIR is, or STTR, and when they do, they like what it brings. It brings a value of innovation from small companies that might have been, I am not going to say overrun by the system of maybe bigger players, but it allows that innovation to come to the forefront. And sometimes you don't know what you don't know. And we want that to happen. We want that to be able to come forward.

So, Mr. Neumann, in your most recent April 2017 report, the GAO states that over the last 7 years the offices of inspector generals at participating agencies have investigated 110 instances of potential fraud in these programs. Of the 110 instances, only 14 were found to be actual cases of fraud.

It seems like a very low number, meaning the SBIR program is run pretty efficiently from a waste, fraud, and abuse standpoint.

Comparatively, how does the SBIR program stack up to other programs in this regard?

Mr. NEUMANN. Well, we didn't compare the SBIR fraud prevention to other fraud prevention programs. But in talking to the OIGs, they certainly have higher priorities for some of their larger-dollar-value programs. For example, DOD is more interested in pursuing contracting fraud. With the limited resources of the IG

they tend to pursue that. But, nevertheless, they didn't see that there was significant fraud in the SBIR program.

And out of the time period you cited there, the 110 investigations over a 7-year period, that is out of 38,000 awards. So they view the SBIR fraud as being a relatively small problem. But, nevertheless, they did want to devote resources to that to make sure that they can prevent any future fraud.

Chairman KNIGHT. Absolutely. And we are always looking to lower all waste, fraud, and abuse, of course, in government as a whole. But we are looking at 12 percent here of cases found that were actually fraud and abuse. So I think that that is a fairly low percentage.

Obviously, we would like to get that down to zero, of course, but as we are looking at these types of organizations and maybe bureaucracies and government issues across the board, if we were at 12 percent across the board, I think that in many regards we would consider that somewhat of a success.

So I am going to move on to the ranking member so that she can get her questions in. And if we have time at the end, we can always go through with a second. But I will yield to the ranking member.

Mrs. MURPHY. Thank you, Mr. Chairman.

Let me first say, Mr. Shepard, that as a parent of a 6-year-old boy and 3-year-old girl, I appreciate and share your commitment to fostering STEM opportunities for the next generation.

My question for you is that the 2011 reauthorization allows agencies to help facilitate the commercialization of the research through the use of Phase III awards, including sole-source contracts. However, we are hearing from small businesses that agencies are not using this tool.

Mr. Shepard, why is there such a reluctance in awarding sole-source contracts?

Mr. SHEPARD. I know that my focus so far with the team, commercialization is essential, obviously, and it is the intent of the program to take us from innovation to commercialization.

I know that the discussions that we have had with program managers, the discussions that I had with the team at SBA have really focused on trying to educate—we talked about entrepreneurial education earlier in Congressman Lipinski's comments—is to educate those entrepreneurs that have made it to the Phase II process, that you are going to come to the end of that, of that Phase II process quickly. It can be within a year, if it is a million-dollar grant.

And they need to start preparing for that really at the beginning of that process to start preparing for commercialization. So we have talked about raising awareness for that. We have talked about bringing in a business development person to help them and to get them to that commercialization point.

To your specific question, I am going to have to look into that more in terms of any kind of reluctance. But we certainly meet with and work with our program managers on a regular basis, and that is easy to investigate, easy to look into, and we will do so on your behalf.

Mrs. MURPHY. Great. Thank you. I would appreciate that.

Then my next question is for both Mr. Neumann and Mr. Shepard.

One of the statutory objectives of the SBIR program is to increase the participation of minority- and women-owned businesses in the R&D arena. Yet, we are seeing participation decrease. For minority-owned firms, percentages are in the teens, and the percentages are in the single digits for women-owned firms. Why this objective so challenging?

Mr. SHEPARD. I will go first. That is obviously frustrating, and it is one of the mandates of the SBIR, is to reach out to those groups. And the only thing that we have continued to talk about, again, during my short time has been awareness, awareness, awareness, to make them realize that that access is available to them. I had mentioned in my opening comments about our work with the universities and going specific to universities.

We have started to make, and I think you will see in some of the activities and awareness activities certainly, where we will start to raise the awareness level, and I hope that it is visible. But it is a challenge, and it is something, again, that we talk with the program managers at all of the Federal agencies about addressing. And it needs to be addressed, and certainly during our time we will make efforts to do so and raise that awareness.

Mrs. MURPHY. Great. Thank you.

Mr. NEUMANN. GAO has been mainly focused on expenditure compliance and the fraud prevention requirements based on congressional direction. But we would be happy to work with the Committee staff to do additional work in this area if that would be useful to you.

Mrs. MURPHY. I think that I would be interested in seeing more information about that. Thank you.

Again, a question for both of you. The SBA has published guidance on benchmarks for Phase I to Phase II transitions. The goal of these benchmarks is to prevent the same companies from continually winning Phase I awards without progressing to Phase II.

Are agencies enforcing these benchmarks? And if so, have there been any cases where a company was made ineligible for the year?

Mr. NEUMANN. Well, I can tell you that we just began work last month for Chairman Smith of the House Science Committee on how SBA has developed benchmarks and what agencies do to ensure that they are not making awards to ineligible companies. We expect to have this preliminary work done by the end of May, and we will plan to brief the staff at that time, and we will work with your staff on getting information to you as well.

Mrs. MURPHY. Great. Thank you.

Mr. SHEPARD. And I am not sure about that specific report. We will certainly work with the Committee, and we will work with our colleagues in GAO to assist in that effort and visit with our program managers to make sure that that compliance issue is addressed.

Mrs. MURPHY. Great. Thank you.

I yield.

Chairman KNIGHT. And I thank the gentlelady.

We are going to take a short recess. We have a three-vote series, and we are about 7 minutes away from the first vote ending, which

means we have about 15 or 20 minutes on that vote. And we will probably be back in around half an hour. So we will take a short recess.

[Recess.]

Chairman KNIGHT. Okay. Thank you all for that brief recess, and we will be back.

And we are going to continue with questions. Ms. Comstock had to leave the room for a meeting real quickly, so we are going to go to the ranking member, Ranking Member Lipinski, for his questions—and we are going to put a bookmark there.

Chairwoman COMSTOCK. It is okay. You go ahead.

Chairman KNIGHT. Okay. We are going to continue on.

Mr. Lipinski, you have the floor.

Mr. LIPINSKI. Thank you, Mr. Chairman.

I thank our witnesses for being here and waiting us out there. I am sure we will make it worthwhile here.

I had, as Mr. Shepard, you had mentioned in answer to another question, I had talked about commercialization efforts. The 2011 reauthorization required agencies to increase their efforts to help commercialized technologies. So I was wondering what you could tell us about what the participating SBIR agencies have done to meet the goal of increased commercialization at each phase of the SBIR program.

Mr. SHEPARD. I appreciate the question, Congressman Lipinski.

You know, as I have been in, again, a short period of time, started to look at some of the reports and some of the dialogue that takes place between SBA and the program managers, I know it is an important focus of ours and will continue to be in the oversight role that the SBA has.

That is one I don't have specific information in terms of a report, in terms of conversions, which I think would be interesting to see. We do have some information—I don't have the data in front of me now—in terms of conversions from Phase I to Phase II, obviously, but then that focus on Phase II into the commercialization.

I do know one of the challenges—and, again, we will address it as best we can—is the self-reporting factor that you have from the small businesses who actually leave the program, go out and commercialize, and then making sure that they report back. But we will be in contact with your staff in terms of a followup on that.

Mr. LIPINSKI. And how do you feel about what I had talked about in my opening about having, sort of, maybe, accelerators give mentoring to Phase II grantees to spread, sort of, what we have right now with I-Corps early on but have that at the Phase II level, some sort of education and maybe through some of the successful accelerators that we already have out there?

Mr. SHEPARD. Yeah, I appreciated and understood the comment about entrepreneurial education that you made and, certainly, in the university setting, where you have scientists that might not have a business development perspective about their product that is coming out of Phase II and is going to be commercialized.

So having that component in terms of the educational awareness, the educational training, be it in the accelerator model or as part of the Phase II, is going to be important for those, certainly, in the academic setting, to be able to transfer their ideas and their inno-

vation as they start going to market and try to commercialize that. So I think it is absolutely an important thing to focus on.

Mr. LIPINSKI. Well, as we move forward in this reauthorization, I think it is something that I am going to continue to work on and work with my colleagues—I would like to work with you, Mr. Shepard—and figure out the best way we can do this.

I think there is widespread support, bipartisan support, for SBIR and STTR, and we all want to make it work as well as possible and succeed. And I think adding more of an educational aspect could be very helpful. I-Corps certainly has proven to be successful.

As a former academic, I know that these are things that are not taught as you are going through grad school and certainly not something that you know as a professor, no matter how good you are in your field and how well you are doing your work. You may have great discoveries and great ideas but may not know how to actually move that forward. And that is what these programs are all about, is finally getting to a good outcome—a new, innovative small business.

So thank you very much.

Mr. SHEPARD. I agree, Congressman. Thank you.

Mr. LIPINSKI. And I yield back.

Chairman KNIGHT. Thank you very much.

And we are going to the Chairwoman of the Subcommittee on Research and Technology, Ms. Comstock.

Chairwoman COMSTOCK. Thank you, Mr. Chairman.

How do we measure success under SBIR and STTR? Is it patents awarded, small business revenue, employment growth, that ability to get to that next stage? What are some of the success markers that we should be looking for?

Mr. SHEPARD. Very good question, Congresswoman. I think all of those that you mentioned, obviously, are good markers. You know, the transition percentages from—you know, obviously, the ultimate objective with meeting the research and development needs of our country, inspiring innovation, and then commercializing, any kind of markers we can put down for that.

As a new administration, we will look and see if there are some metrics that we need to add. We are fully committed, as you heard from Administrator McMahon, to making sure these programs are efficient, to make sure that they are effective, and to make sure that programs are meeting the types of outcomes that they are intended to meet.

So adding additional metrics is something that we can look at to make sure that we are measuring appropriately, and then working with Congress and the program managers, obviously, as they report back to the SBA in its oversight role to make sure that we are measuring correctly.

Chairwoman COMSTOCK. All right.

And Mr. Neumann?

Mr. NEUMANN. We haven't looked at the metrics in the work that we have done. We have mostly focused on, you know, the spending compliance and the fraud prevention requirements in the work. But, certainly, those are important metrics, and we would be interested in considering looking at that in future reviews.

Chairwoman COMSTOCK. Okay.

And then we have heard from some of our folks who have been involved that get in there at that entry level and then they aren't supported in going to that next level, or they feel like their good ideas may be otherwise appropriated throughout agencies, and then they don't get that credit and opportunity.

Do you see that? And how do we provide the incentives for people to come in and know that, well, if this takes off, you are going to be a beneficiary, it is not going to be appropriated by others?

Mr. SHEPARD. That is, again, an excellent question. You want to engage the entrepreneurial community to make sure, if they come in for a Phase I, that they have some assurance that there won't be, certainly, a hindrance with the program moving into a Phase II.

I don't have data on that. I can certainly look into that and report back. But we certainly want to have the program run in a way that there isn't a hindrance to moving from Phase I to Phase II for those innovators that are part of the program.

Chairwoman COMSTOCK. Okay. And I might have some followup questions, because we have had some folks talk to us about that. I don't have all the details right in front of me, but that has been a concern——

Mr. SHEPARD. Yeah, very good.

Chairwoman COMSTOCK.—that has been raised.

Mr. SHEPARD. Yeah. We would be more than happy to look into those details, those specific cases, and then address them on a one-by-one basis and communicate back to the Committee on that.

Chairwoman COMSTOCK. Okay.

Mr. Chairman, I will yield back.

Chairman KNIGHT. Thank you very much.

And, at this time, I would like to welcome Mr. Estes to our Small Business Committee and to our Subcommittee on Workforce and Contracting and ask him to ask questions for 5 minutes.

Mr. ESTES. Thank you.

Mr. Shepard, in your testimony, you talked a little bit about the administrative funding pilot program. And can you talk a little bit about why you see the great value in that and what you are getting out of that?

Mr. SHEPARD. I think the primary benefit that we have heard from the program managers at all of the Federal agencies that are participants in the programs has been their ability to do pilot programs, to raise awareness, and to focus on raising awareness for the programs. That has been one of the main benefits.

One of the critical things, obviously, is being able to collect data, have timely data submitted. And I know that the program offices have also used that administrative funding pilot, the proceeds from that, in terms of data collection and data reporting.

And we have seen an increase in that from the team and the visits that I have had with them thus far. And so, really, awareness and data have been two areas where they have been able to focus, that they didn't focus on so much before, with the funding that became available through the administrative funding pilot.

Mr. ESTES. I know one of the earlier questions was talking about some of the analysis there. I know you have had, what, 43

days to get up to speed on this. Do you have an approach that you are going to use that data to analyze the good and the bad with?

Mr. SHEPARD. There is a lot of data. And, absolutely, yes, we will do so. Yes, sir.

Mr. ESTES. Okay. Thank you.

Mr. Neumann, what kind of changes are you looking at making in your policy directive and some of the thought process that you are having in terms of proposed regulations and looking at doing some things differently there?

Mr. NEUMANN. Well, we have made a number of recommendations to SBA to make updates to the policy directives on a number of issues, and they have been taking steps towards some of those things.

I think, just getting back to the administrative pilot question you asked about, I think we see SBA being in a unique position to really do a thorough evaluation of how those funds are being used and determine if there are constraints to agencies being able to use them effectively.

So I think Mr. Shepard's discussion of evaluating that data will be really important to improving the success of that pilot if it is extended beyond this fiscal year.

Mr. ESTES. Okay. Thank you.

Mr. Chairman, I yield back.

Chairman KNIGHT. Thank you very much.

And we would like to go to Mr. Lawson for his 5 minutes of questioning.

Mr. LAWSON. Thank you very much, Mr. Chairman.

And welcome to the Committee.

My first question centers around, yesterday, we hosted a hearing on the growth of accelerators in the small-business space.

Mr. Shepard, can you describe the connection between the accelerators and the SBIR and STTR program and how SBA can work hand-in-hand to guarantee that both of these programs can coexist with the accelerators?

Mr. SHEPARD. Thank you for your question, Congressman.

I have and the SBA has accelerator data from before that we are reviewing to see the types of impacts that the program has had. And so we are in the process of doing that right now, from the previous accelerator program.

I do know, initially, from the initial look, that having accelerator entities throughout the U.S. that understand the SBIR/STTR program and being able to educate those communities locally about the program—so, again, it is awareness and it is education—has really been the primary link that I have seen so far in reviewing the information between that linkage you are talking about between accelerators and the programs.

Mr. LAWSON. Okay.

Mr. Neumann, what changes have you seen over the past several years in the small-business spaces that have impacted the success of the SBIR and the STTR program? And what changes do you see on the horizon for these programs?

Mr. NEUMANN. Well, in our review of expenditure compliance, you know, agencies are generally spending what they are required to spend on the program. So we are seeing improvement in that.

We are seeing improvement in terms of the information that SBA is collecting. And we would like to see some additional improvements in SBA's evaluation of the constraints of various aspects of the program, including the administrative pilot program, and also evaluating the effectiveness of fraud prevention efforts.

So I think there is some more that can be done there, but we have been seeing improvement overall in at least the expenditure compliance side, that agencies are spending what they are required to spend for the programs.

Mr. LAWSON. Okay. Thank you.

And this question can be to both of you all on the panel. I represent Jacksonville and Tallahassee, which includes major universities, including Florida State University, which has a major innovation hub called Innovation Park, which is not too far from where I live.

And what do you see on the horizon in terms of the universities? Because my district also includes two historically African American colleges, which you talked about earlier, Mr. Shepard, which is Edward Waters and Florida A&M University.

The question is, how can we create a pipeline to HBCUs'—I heard you before we took off to go vote—graduates into the STEM field that would help these students create their own small businesses that can eventually take part in such programs like SBIR and STTR?

Mr. SHEPARD. Very good question and, obviously, in the opening remarks, Congressman, a focus and a concern of ours for the program managers and then the SBA.

I think, you know, I have talked about awareness, I have talked about education. One of the things that—and visiting, being there physically, connecting those universities with the small-business development centers that the SBA has. Those entities are well-versed in the SBIR/STTR programs.

We have an increasingly more robust presence through sbir.gov for training modules, train-the-trainer tools, that allow students, certainly, that are pursuing their undergraduate, master's degree, doctorate degrees to go there, as well, and use those resources to learn more about the program.

So just a couple of thoughts and a couple of ideas about some resources that are currently out there. But, at the end of the day, it is really awareness and encouraging them to find out more about those programs and use the resources that are existing for them to pursue those opportunities that are there for them to access.

Mr. LAWSON. Okay. Thank you.

I yield back.

Chairman KNIGHT. Thank you very much.

And I am proud to have our Committee Chairman for Small Business, Mr. Chabot, here, and I would like to give him some time to ask questions.

Chairman CHABOT. Thank you very much. I will be relatively brief, Mr. Chairman, because I just stepped in, and I had a number of other meetings. But I want to thank you for your leadership on this committee. We are very pleased with what we see so far, and keep up the good work.

Mr. Shepard, I just have one question. I will direct it to you, if I can. Obviously, one of the Congress' and this committee's principal responsibilities is oversight, making sure that the tax dollars that the American people send to us are used efficiently and that everything is going according to plan.

And I know you have only been in your position for, I think, a grand total of, like, 38 days now or so, so not too long, so I am certainly not directing this at you. But the previous administration was somewhat remiss in getting the reports back so we can do the appropriate oversight on schedule, shall we say—pretty far behind schedule, I have to say.

When might we expect fiscal year 2014, fiscal year 2015, fiscal year 2016 annual reports to come to us so we can do the appropriate amount of oversight so we can guarantee that the American tax dollars are being spent in the way the American people have a right to expect, and that is that they are most efficiently spent?

Mr. SHEPARD. I appreciate the question, Congressman Chabot.

One of my first questions when I arrived into the office and a fiscal year end 2014 report was put in front of me was, "I think there is a problem with the date. I think this should say 2016." And I soon found out that I had and the administration had inherited some tardiness in terms of some of those reports.

In regards to the fiscal year end 2014, we immediately took action on that in terms of making sure the appropriate clearance process took place inside the SBA. And that is taking place now. So we are looking at it internally and hope to have that forthcoming.

We share the concern. There is an intent to—we need to report to Congress, and we need to do it in a timely manner. So I share the concern; the Administrator shares the concern. And we are in the process of doing that with the fiscal year end 2014 annual report on the program and also have initiated and are in process on the fiscal year end 2015 report, as well. So both of those are taking place. And then we will soon start on the fiscal year end 2016 report, as well.

So you will see more timely annual reports forthcoming out of this office going forward. So I appreciate the concern. It is a concern that we share. And it is part of our job to report on a timely basis, and we will do so.

Chairman CHABOT. All right. Thank you. I would, you know, as chair of the Committee, strongly urge you to do that in as expeditious a manner as possible so that we can do appropriate oversight.

Thank you very much. I yield back, Mr. Chairman.

Chairman KNIGHT. Thank you very much. And I appreciate the leadership from the Chairman.

And we will now go to Mr. Tonko for his questions.

Mr. TONKO. Thank you, Mr. Chair.

As the Science Committee's only New Yorker, I would like to start off by welcoming SUNY Stony Brook Professor Clinton Rubin.

Thank you for joining us today.

He is also director of the Long Island Science Hub and will participate in our second panel. And I thank him for educating us today but, more importantly, thank him for his passion, the passion

that he brings to the table and for all of his hard work. It is much appreciated.

I am excited that we are holding this hearing today because I strongly believe in the value of the SBIR/STTR program. This program has proven to be one of the most successful Federal programs for technological innovation in United States history, delivering more than 70,000 patents, close to 700 public companies, and approximately $41 billion worth of venture capital investment, as well as valuable innovations in agriculture, in defense, in energy, health sciences, in homeland security, in space and transportation and many other fields.

Through Phase I and Phase II SBIR, countless jobs have been created in my district in the capital region of New York. It is through programs such as SBIR that my district has developed the underpinnings of support for a boom in health technology innovation and economic development.

This funding has resulted in cutting-edge technologies, well-paying jobs, and overall has been a recipe for successful innovation. The capital region is an exponentially growing area for clean energy technology and biotechnology, and I want to ensure that the support for these areas only continues to grow stronger. Smart investments like SBIR and STTR will allow for this continued growth to happen.

I am proud of and inspired by the research and innovation in small businesses in the capital region, which are venues that have greatly contributed to advances in science and technology across the board. From conversations I have had with small business leaders, I can see that they value this program.

Dr. Clinton Ballinger, the CEO of SelfArray, Inc., told me, "My biggest issue as a CEO of a startup is to keep the Federal SBIR program funded. The venture capital community has grown very risk-averse and simply does not invest until a new technology is nearly developed. Some technologies cannot be self-funded by the inventors, and this is where the SBIR program contributes greatly."

I also heard from Ted Eveleth, the CEO of HocusLocus, LLC, located in Albany, New York. Ted said that the reality he encounters is that companies don't perform research and development anymore because it is too risky and shows up as an immediate expense. Ted said, and I quote, "This is true from life sciences companies to old line manufacturing companies. Without the SBIR program, innovation in the United States would come to a screeching halt."

While in Austria, Ted listened to a panel discussion with representatives from four different countries talk with awe about the SBIR innovation program, their machine that they are trying to imitate in their own countries. Ted summed up their thoughts by saying that "the SBIR program makes the United States the envy of the world." I could not agree more.

So, with that being said, Mr. Shepard, the 2011 reauthorization allows NIH, DOD, and the Department of Education to conduct a pilot program to allow a small business to receive a Phase II award without having received a Phase I award, also known as the Direct to Phase II Pilot. I have some concerns that allowing companies to

skip Phase I would shut out some small businesses from competing for SBIR award funding.

Can you please elaborate on Direct to Phase II funding and efforts to prevent marginalization of some of our small businesses?

Mr. SHEPARD. Thank you for your question, Congressman.

I am very aware—again, new in the job—about the Direct to Phase II. The initial data that I have seen is—and I, quite frankly, was a little surprised that it isn't utilized more. It has been very, very nominal. We will report on that and understand the concern about a skip in the Phase I that might occur.

I will, again, just make sure, you know, that I focus on that and that I will be able to communicate back a little more data about what is actually occurring. Again, my summary is that going direct to Phase II hasn't been as high an activity level as one might expect, but we will report back on that.

Mr. TONKO. Absolutely. I think it is very important to review what that impact is going to look like. We don't want to wreck a good program. We don't want to marginalize any of our small businesses.

So, with that, I thank you for responding and will look forward to the reviews that you will conduct.

Thank you, and I yield back, Mr. Chair.

Chairman KNIGHT. Thank you very much.

And I think we have had a spirited first panel. And I would like to take a little bit of time, thank you very much for coming in. Thank you for answering the questions in an honest and open way.

This is a good hearing where we are trying to understand how this program works, that there are possibilities to make it better, but it is working and helping to bring forward that innovation that we crave here in America. And we don't want it stifled, and we don't want it stamped out. We want to encourage that. So I think that these programs do that, and that is part of what this panel is bringing forward.

So, with that, I will thank the panel and excuse them. And we will ask for just a very short break so we can bring the second panel through.

Mr. SHEPARD. Good. Thank you.

[Recess.]

Chairman KNIGHT. Again, thank you to the first panel.

And we are moving on to our second panel. We are going to go down the line and introduce—I think the Chairwoman will be back shortly and she can introduce Dr. Langford, but we might skip him on the introductions and wait for her to come back.

We are not forgetting you. We will get there.

Just like that. That is how Congress works. We ask and it happens. Sometimes.

Our first witness on the second panel is Mr. John Clanton, Chief Executive Officer of Lynntech, Incorporated, in College Station, Texas.

Lynntech was founded in 1987, providing early-stage scientific research and technology development for government-sponsored initiatives. Key Lynntech projects include high-performance fuel cells for the military, enhanced search and rescue components for the Coast Guard, and cost-effective biohazard detectors for Home-

land Security. The company currently employs 100 scientists, engineers, and support staff.

Mr. Clanton has endowed a faculty fellowship at Texas A&M's Mays Business School, and he is also an Eppright Distinguished Donor to the 12th Man Foundation.

Thank you for being with us today.

I will now yield to the Chairwoman of the Subcommittee on Research and Technology, Ms. Comstock, for the introduction of our next witness.

Chairwoman COMSTOCK. Thank you.

I am honored to introduce Dr. John Langford, Chairman and CEO of Aurora Flight Sciences Corporation, which he founded in 1989 and is headquartered in Manassas, Virginia, my district.

Prior to Aurora, Dr. Langford worked for the Institute for Defense Analyses, where he organized and led a series of human-powered aircraft projects that shattered the world distance and endurance records for human-powered flight. He also worked for the Lockheed Corporation as an engineer on the development of the F-117 stealth fighter.

Dr. Langford also cofounded Athena Technologies in 1998, serving as CEO and Chairman before the company was sold to Rockwell Collins in 2008.

Dr. Langford received his bachelor's degree in aeronautics, a master's degree in aeronautics and astronautics, a master's degree in defense policy, and a Ph.D. in aeronautics and public policy, all from MIT.

And we are delighted to have you here today.

Chairman KNIGHT. Very good.

Up next is Mr. Ron Shroder, Chief Executive Officer, President, and Chairman of the Board of Directors of Frontier Technology, Incorporated, or FTI, in Beavercreek, Ohio, a place I am very familiar with, growing up at Wright-Patterson.

Mr. Shroder has nearly 35 years of diversified technical and management experience in the Department of Defense, commercial, and other Federal markets. During his tenure, FTI was award the SBA Tibbetts Award for the very best in Federal innovative research. He has been a member of the Governor's Ohio Aerospace and Aviation Technology Committee and is the former national president for the Defense Planning and Analysis Society.

We thank you, Mr. Shroder, for being here.

And I would like to now yield to the ranking member of Contracting and Workforce, Mrs. Murphy, for her introduction of our next witness.

Mrs. MURPHY. Thank you.

It is my pleasure to introduce Ms. Angela Albán, president and CEO of SIMETRI, a small business that develops and designs medical training devices to improve the performance of military personnel as well as physicians, nurses, and first responders.

SIMETRI has received a 2014 Phase I and 2015 Phase II SBIR award from the Department of Defense. I am very proud to say that Ms. Albán's business is headquartered in my congressional district in the city of Winter Park.

Ms. Albán also serves as the chair of the National Center for Simulation board of directors, the charter school board chair for

United Cerebral Palsy of Central Florida, and a member of the Orlando Regional Chamber of Commerce board of directors.

She has a bachelor of science degree in mathematics and computer science from Emory University and a master of science degree in computer engineering from the University of Central Florida.

Welcome, Ms. Albán, and thank you for testifying today.

Chairman KNIGHT. Very good.

And our next witness is Dr. Clinton Rubin, State University of New York's Distinguished Professor, Chair of the Department of Biomedical Engineering, and the Director of the Center for Biotechnology at Stony Brook University in Stony Brook, New York.

Dr. Rubin's work is targeted towards understanding the cellular mechanisms responsible for growth and healing. He has published over 200 peer-reviewed papers and 50 book chapters in his field and holds 22 patents, with 14 pending, in the area of wound repair, stem cell regulation, and treatment of bone disease.

We thank you very much, Dr. Rubin, for being here today.

And, again, it works like a stoplight. And since I was a cop for 18 years and not a very good ticket writer, I will be very, very lenient. But just know it goes green, yellow, red, and that is just the way is. So when you are at red, please kind of start to wrap it up.

And we are going start with Mr. Clanton, and you have 5 minutes.

STATEMENTS OF JOHN CLANTON, CHIEF EXECUTIVE OFFICER, LYNNTECH, INC.; JOHN S. LANGFORD, CHAIRMAN AND CHIEF EXECUTIVE OFFICER, AURORA FLIGHT SCIENCES CORPORATION; RON SHRODER, PRESIDENT AND CHIEF EXECUTIVE OFFICER, FRONTIER TECHNOLOGY, INC.; ANGELA M. ALBÁN, PRESIDENT AND CHIEF EXECUTIVE OFFICER, SIMETRI, INC.; AND CLINTON T. RUBIN, SUNY DISTINGUISHED PROFESSOR AND CHAIR, DEPARTMENT OF BIOMEDICAL ENGINEERING, DIRECTOR, CENTER FOR BIOTECHNOLOGY

STATEMENT OF JOHN CLANTON

Mr. CLANTON. Thank you.

Chairman Knight and Ranking Member Murphy, Chairwoman Comstock and Ranking Member Lipinski, members of the Subcommittee, on behalf of Lynntech, I would like to thank you for the opportunity to appear before you today and offer our company's views on improvements to the SBIR program.

I have included in my statement today a few examples of victories that our scientists and engineers have had to give you some insight into the daily life and times of a small research company.

The first example is a project to develop a hypoxia training device for naval aviators, a project that started about 3 years ago. The Navy identified a need for a flexible, programmable, and inexpensive device to train aviators to recognize the early signs of hypoxia in flight.

Next week, we will be starting a Phase II.5 contract to prepare the device for manufacturing. And the week after that, we will be attending an event in Rotterdam at the request of several NATO

air forces to demonstrate the device for their potential procurement.

As it relates to the SBIR program, first let me say that we applaud past efforts to make the SBIR program more flexible. Those changes allow agencies to piggyback on prior investments and bring technologies to market at a rapid pace. We were excited and appreciative to see that the SBIR program was reauthorized last year but believe an opportunity was missed by not adopting several measures that were being considered for inclusion in the program. We are hopeful that these improvements can make their way into a new bill going forward with the joint support of both the Science and Small Business Committees.

I will summarize our recommendations, which we believe would improve the overall success metrics of commercialization.

First, as has been discussed, several pilot initiatives from the 2011-2012 reauthorization are set to expire at the end of fiscal year 2017. Two of these initiatives that have had a notable impact are the Direct to Phase II awards and the addition of the 3-percent administrative pool. We strongly believe that both have had a positive impact, and we encourage you to make them permanent elements of the program.

The Direct to Phase II award allows the government and industry to capitalize on work previously done in a research area and to use that prior work to advance the commercialization path for important technologies.

As it relates to the Direct to Phase II success, Lynntech has another project that I want to tell you about. This particular project began life as a NASA-funded Phase I effort to create an inexpensive and highly precise fluid pump for astronaut environmental suits.

The same underlying technology was used to respond to an OSD requirement for an en-route care drug-infusion pump for forward-deployed soldiers. Successful work in these past projects led the Air Force to award Lynntech a Direct to Phase II award to adopt the base technology into a multichannel drug-infusion pump.

The second pilot program, the 3-percent administrative pool, has been an effective vehicle to assist acquisition managers with improved SBIR transition strategies and movement towards Phase III initiatives. We believe that the 3-percent pool functions as a productivity lever for the program offices, and we ask that you make it permanent as well as clarify congressional intent as to using the pool for commercialization support.

Other recommendations that we support include: clarifying congressional intent by making it clear that subsequent Phase II awards are not subject to a competitive acquisition process since the competitive pool was created by the Phase I process; allowing Federal agencies to award up to $3 million on Phase II awards; allowing Federal agencies to make multiple Phase II awards in support of commercialization efforts; and, finally, allowing for cross-agency Phase II awards in circumstances where small business has received a previous SBIR award from another agency. We believe this needs to have clearer definition in the SBA policy directive.

Lastly, I want to emphasize the symbiotic relationship that Lynntech and most other SBIR companies have with their univer-

sity partners. Currently, our university partners receive nearly 20 percent of our contract awards in the form of subcontracts. We believe there are unlimited opportunities for universities and SBIR participants to complement each other's core competencies in support of the mutual objective of transitioning technologies out of the lab and into the marketplace without directly competing for taxpayer dollars.

I appreciate the opportunity to offer Lynntech's position on program improvements that will enhance the commercialization of SBIR-funded development. I stand ready to answer any questions you may have.

Chairman KNIGHT. Thank you very much.

And, Dr. Langford, you are now recognized for 5 minutes.

STATEMENT OF JOHN S. LANGFORD

Dr. LANGFORD. Thank you very much, Chairman Knight, and thank you, Chairwoman Comstock and other members of the Committee. It is a real thrill to be here today to have the chance to talk with you about a subject that is near and dear to my heart, which is the SBIR program, and also specifically to have a chance to talk to you, because I have spent a good part of my life building airplanes in the Virginia 10th and then flying them in the California 25th and environs. And being able to share that experience with you and with the rest of the Committee is very, very meaningful.

I think it is best summarized by the fact that, last week, in Dallas, our company was announced as a partner with Uber in their latest program called Uber Elevate, which is an attempt to deploy by early in the next decade a series of electric, vertical-takeoff and -landing, passenger-carrying, autonomous vehicles. These are things that you could imagine using an app on your cell phone, like the standard Uber app, and being able to summon in the third dimension a vehicle that would carry a couple of passengers in the urban environment on demand.

And our ability to participate in a program like that is partly the result of dozens, literally, of SBIR programs over the last 20 and 30 years, which were not ever specifically aimed at such an application but which illustrate the fact that commercialization is not a linear process, right? It is something that happens out of a combination of planning and performing the research, and then the applications occur in different ways.

Our first award as a business was from NASA back in 1989, and it was for an electric aircraft application, the particular one of fuel cells for airplanes. That led to a series of DARPA-funded initiatives that were aimed at developing quiet ducted fans. And that led to a non-SBIR program called the XV-24 that DARPA is running that we were able to defeat four major established companies to win and is now being built today in Manassas. And then that program has led directly into our ability to commercialize that technology into programs like what Uber is pursuing.

In turn, the fact that Uber chose the electric VTOLs for these urban mobility activities will also, I predict, be transferred back into the government sphere. Organizations like the Marine Logistics Organization are very interested in similar types of vehicles for

moving cargo efficiently back and forth over distances, say, between amphibious ships and the shore.

Since I started the company in 1989, we have won over 200 SBIR programs, totaling about $59 million, which has been a relatively small fraction, under 5 percent, of the revenues that the company has been able to generate, about $1.2 billion to date, however the SBIR funding has been critical seed funding because it really does serve as sort of publicly funded venture capital, as people on this committee have talked about and acknowledged.

And I particularly wanted to echo the comment earlier from the gentleman from New York about the important international element of this, that everyplace I go overseas people are amazed to hear about the SBIR program. They literally can't believe that the U.S. Government will give you money to start a company.

And the SBIR plays a really unique role, because you can't run a company just on the SBIR program; it is a supplement, it is a piece, it is a tool in a toolkit of what allows a culture of innovation. And it is an area that we still lead the world in.

We spend a lot of time as a society talking about government programs that don't work or don't meet their expectations, and it is really refreshing and I think we should all celebrate the fact that in SBIR we have a program that really does meet its original goals, that has, I think, stood the test of time. It is an important part of maintaining this country's international competitiveness, and deserves everyone's continued support.

I look forward to being able to discuss any questions. Thank you.

Chairman KNIGHT. Thank you very much.

And, Mr. Shroder, you are now recognized for 5 minutes.

STATEMENT OF RON SHRODER

Mr. SHRODER. Chairmans Knight and Comstock and Ranking Members Murphy and Lipinski and the two Subcommittees, thank you for the invitation to speak. It is quite an honor.

Before I begin, I believe it is critical to talk about how a strong R&D culture is so important to our country and how the SBIR and STTR programs are such an important piece of that culture. If in doubt, go back to the Air Force 2014 impact study and the recent Navy study to see the incredible metrics that make this program probably the best small-business program ever in the history of the country.

The entire community owes a great deal of debt and gratitude to the original founders of this program. It was almost a "Shark Tank"-like concept that was created 35 years ago that we can all be so proud of. Major corporations like Qualcomm, Amgen, Symantec, iRobot are just the rockstars of that culture that many of us today want to be a part of.

In addition to that, Congress has played an incredibly important role in that. Your adjustments over the years, not only the continued reauthorization but trying to cut down the delays between Phase Is and Phase IIs, looking at the size standards and how you can deal with that when it comes to commercialization, strengthening the intellectual property rights, have all been incredibly important for small businesses to be successful in this program.

Having said that, I think as we look at improvements for the program we have to go back to the core and the intent of the program, and that is stimulation of technological advancements, small-business innovation in the Federal R&D sector, participation by the socially and economically disadvantaged businesses, as well as commercialization of the technologies into economic growth.

There is a great deal to be proud of in each one of those areas. There are also some changes that can be made to improve each one of them, as well. Today, I would like to focus on the commercialization. That is where my passion is, and that is where Frontier Technology that I represent today has had the most success.

What I find is it is an incredibly great opportunity. We were founded by an entrepreneur that believed the researchers should be part of the ownership of the company. We convinced those great entrepreneurs and R&D people to come in and be a part of our company, be an owner. And then we found ourselves located in locations like southwestern Ohio, Virginia, the southern California area, northern Alabama, where we were fortunate enough to be with real R&D superstars in the Federal Government. When you combine those two, you have an entrepreneurial opportunity that is enormous.

Having said that, what we found is that the Phase Is, Phase IIs, the CPPs the Phase II-1/2s, et cetera, the RIFs, were all like "Shark Tank" funding; they helped you, but they were not the answer. They really were associated with short-term job opportunities and short-term durations. Where you really needed to be successful to give these employees and owners a long-term job was in the Phase III commercialization. And that is where we focus most of our time.

The problem is, when you go to implement that, you are going to find out that it is much harder than what most people think. I am sure it is harder than what your intent is. Because what happens is the SBIR community recognizes that they know about SBIRs. They come away with an insight from SBIRs that generally come from their interaction in Phase Is and Phase IIs. But do most realize that Phase Is and Phase IIs are almost the exact opposite of Phase IIIs?

Phase Is and Phase IIs are R&D money. Phase IIIs are any kind of money. Phase Is and Phase IIs are competitive. Phase IIIs are sole-source. Phase Is and Phase IIs are limited dollar amounts. Phase IIIs are unlimited.

When you take your opportunities for Phase III commercialization to the people that think they understand SBIRs and you talk about those variations in Phase IIIs, you typically get a response that involves "it is almost too good to be true."

And so, today, as we go forward and try to do the commercialization, what we have found is the efforts that you have done to educate the community are the most important things you can do to help us as small businesses be successful. The Navy manual for Phase III guidance has had a huge impact. The Air Force manual for Phase III guidance has had a huge impact. It has educated a community to say that it is real; it is allowed; let these small businesses take these technologies and grow.

And so, today, as you look at improving the programs, I would say definitely continue the 3 percent. And make sure that 3 percent is structured in a manner that prioritizes what you care the most about, which is going to be that commercialization. Make sure there are ombudsmen. Make sure there is education for the socially disadvantaged organizations that need to get into the program. Make sure that the agencies have Phase III offices that facilitate the knowledge of Phase III contracting to those people that want to tie into the technology.

With those kind of changes and your existing laws that require them to report appropriately when implemented, as we heard today, at a fullest extent, I think you will see an incredible growth in the opportunities that come out of Phase III commercialization and the intent of this program.

I look forward to questions.

Chairman KNIGHT. Thank you very much.

And, Ms. Albán, you are now recognized for 5 minutes.

STATEMENT OF ANGELA M. ALBÁN

Ms. ALBÁN. Good morning, Chairman Knight, Chairman Comstock, Ranking Member Murphy, Ranking Member Lipinski, and members of the Subcommittees. My name is Angela Albán Naranjo, and I am founder and president/CEO of SIMETRI, a small, woman-owned, minority-owned business based in Winter Park, Florida, and currently participating in the SBIR program. Thank you for allowing me to share my experiences with you this morning.

The program affords me and has afforded me the opportunity to grow our team and capabilities, make us more competitive, and achieve our mission statement, which is to improve medical outcomes through innovative training technology.

I would like to give you some background on our business and how I start the company so you can understand how this program has and can continue to transform lives and communities.

I was born in Colombia and emigrated to the United States when I was 5 years old. I decided to become an engineer, and, after 14 years as a simulation engineer in central Florida, I decided to start a company, SIMETRI, in 2009.

This program, the SBIR program, has allowed me to hire more staff and develop foundational processes, methodologies, and technologies that have prepared us for future work. Today, we employ 12 people, and we are achieving our company's mission.

The U.S. Army's research lab in Orlando, the Advanced Training Simulation Division, helps us develop new technologies to address training gaps in the ability to train new, emerging medical procedures accurately and effectively. They created an SBIR topic to which we responded, and we received both a Phase I SBIR and Phase II award in 2015.

We developed a capability to accurately teach a lifesaving procedure called the humeral head intraosseous insertion. Our design focused on affordability, realism, and sustainability. I am grateful most of all for the government counterparts at ARL that has resulted in us now being awarded a second Phase II. And they are allowing us to take this training device to market and transition it to the warfighter.

Due to the highly competitive nature of the SBIR and STTR topics, however, the probability of win is often not enough in some cases to justify the resources required to prepare a proposal. Small businesses have to maximize their offering, often partnering with universities and industry, making the smaller budgets even that much smaller.

The SBIR and STTR programs are also not sufficient enough to commercialize technology, as many of my panelists have mentioned already, into a long-term and sustainable product. I have to actively build a network around me to facilitate growth and transition of our technology.

Fortunately, I live in a community that is rich in a lot of these different services and ecosystems that support entrepreneurs. I have participated in many programs, to include the University of Central Florida's incubator program, Rollins College ATHENA PowerLink program, GrowFL economic gardening program, and also the DOD's Velociter Program. We have also received matching grants through the Florida High Tech Corridor to enhance the small amounts of funding that we can share with universities.

These organizations have helped grow 34 companies, in the case of the incubator, to deliver actually 130 Phase I SBIR awards and 60 Phase II SBIR awards. The ATHENA PowerLink Program has helped over 40 female entrepreneurs in central Florida to grow their businesses 30 percent both in revenue and in staff. GrowFL has assisted more than 900 companies throughout the State of Florida, resulting in 16,000 additional jobs, direct jobs, throughout the State, with over $3.4 billion in revenue. And the Florida High Tech Corridor has helped 360 companies across 1,400 research projects, generating more than $900 million in quantifiable impact.

I am fortunate to live in a region that enables me to commercialize and transition technology. I ask you to consider continuing similar programs at the Federal level to provide these opportunities across the Nation. I do not believe that these programs are available and this type of an environment is available in every community. I also invite you to study the resources that are available in central Florida for entrepreneurs as a model for other communities.

My colleagues at Aptima, another small business, have been participants in the program for over 20 years. Because of this program, they anticipate 15- to 20-percent growth annually for the next 2 to 3 years, much of that happening in central Florida.

This growth could be greater, however, but there is a disconnect between the SBIR and STTR pipeline with the POM process. As technology matures, Phase III funding decisions often require being represented as a program in the POM prior to that, which fails to recognize the natural phasing of this technology and the way that we can transition it successfully.

There are no tangible incentives to transition technology, because this often results in risk. We must change the way we view failure in acquisition programs and instead embrace these as opportunities to leverage all there is to learn and to move forward into the next iteration.

It is clear that, also, continuing resolutions and the resulting unstable funding affect force readiness. I would submit that this

threat is especially felt in small businesses performing this type of research. And we cannot absorb the breaks in program funding that often occur under these circumstances.

In conclusion, I want to reiterate that, not only as a participant but as a taxpayer, I believe in this program. We are at a critical time in our Nation's history, and it is now more imperative than ever to continue to be a world leader. A shift has occurred that puts us at risk in our ability to drive technological change and revolution. We have opportunities to expand and improve health care, communications, computations, cybersecurity, and many other crucial technologies required to defend the freedoms that we hold dear.

This concludes my statement. Thank you for your attention, and I look forward to any questions that you may have.

Chairman KNIGHT. Thank you very much.

Dr. Rubin, you are now recognized for 5 minutes.

STATEMENT OF CLINTON T. RUBIN

Dr. RUBIN. Thank you, Chairman Knight, Chairwoman Comstock, Ranking Members Murphy and Lipinski, and Committee members for the opportunity to talk about, rather than Phase I, II, and III SBIR/STTR programs, Phase 0, proof-of-concept centers.

I am very fortunate to be the director of the Long Island Bioscience Hub, which is one of three of the NIH programs that is intended to sort of harness the great biomedical research that is done at our universities and help facilitate and transfer them out into the real world.

I am giving you this perspective as a hardcore basic scientist. I actually study stem cells as means of treating osteoporosis, obesity, and diabetes. And through my research and my—every scientist's passion and goal to see their research actually help health and society, create new therapeutic diagnostics, medical devices. The challenge is in this translational research, this bench-to-bedside, the challenges that we need to recognize that these innovations, these discoveries, this science needs to be commercialized in order to ultimately impact our health.

It is from this perspective that I would like to try to make four points this morning.

The first one is this translational research. At medical schools around our country, we tend to think of translational research as innovations that come to the bedside to help health. Again, let me emphasize that, without young companies or established biotech and pharma companies, this research actually will never actually see the light of day. It needs to be protected with intellectual property; it needs to be shepherded through to the commercial sector.

The second point is that all of our universities, certainly in your districts and certainly within New York, as represented here by my colleagues at the table; there are many entrepreneurial faculty out there, but they are a very, very small percentage of our university beds. I will be generous and say that it is 2 to 3 percent. That means that there is so much research out there that remains untapped, this primordial soup of really robust, cutting-edge innovation that basically never sees the Phase I, II, and III of the SBIR/STTR program.

That is really where the robust, the really principal opportunity of a Phase 0 program comes in. Where the infrastructure is developed to help faculty and students recognize the potential of their research and to translate it through the commercial sector to the bedside.

It was raised a number of times this morning about students and STEM fields and what our next-generation entrepreneurs will be. And I would say that these Phase 0 concept centers are really excellent environments for the students, working with faculty and postdoctoral fellows, to be exposed to and experience the thrill of seeing science become innovation.

So if we are worried about our next generation becoming entrepreneurs, the universities are great places to have it happen and to drive it into whoever will be applying SBIR or STTR programs in the future.

Let me speak very briefly about the REACH program itself. It is the Research Evaluation and Commercialization Hub. As I said before, we are one of three. We have been in existence for just 2 years. We have already used these funds to fund over 33 projects. We have submitted over 30 disclosures for new intellectual property. We have actually submitted SBIR programs, some of which have now been funded, from this technology that would have never gone down the commercial path. This Phase 0 program is really, effectively, harnessing the potential of discovery to bring out to business.

And I will also point out that companies are being formed. So, rather than thinking of this as a competition for SBIR programs—again, my colleagues here that expressed the passion, the impact so well—it is the future applicants for STTR/SBIR programs that these Phase 0s support.

I will also point out that it does not dilute the impact of our university environments. We have heard this morning about the potential of the university being the economic engine for our communities. It is really an attractant for great, new companies to start. And I believe that these Phase 0 programs, which—I think the vision of your committee instituted them. I would encourage you to continue them, because they are really changing the nature of how we think of our science and actually implementing the abilities for these discoveries to become therapeutic.

Thank you very much.

Chairman KNIGHT. Thank you. And on the Small Business Committee, we always thank you for the opportunities and for the employment that you provide.

I am going to go to the Chairwoman for Research and Technology, Mrs. Comstock, for her questions.

Chairwoman COMSTOCK. Thank you, Mr. Chairman.

And I really appreciate hearing your testimony and your passion about this in the culture of innovation that you all are supporting.

So what I wanted to ask of each of you is what top recommendation would each of you make for improving SBIR and STTR programs to promote innovation and really get those cutting-edge things like you all have been involved in? And then what are some additional examples of what we can see in terms of getting that culture of innovation really thriving?

Mr. CLANTON. Well, I believe from our standpoint, the two pilot programs being extended past the current year are kind of at the top of the list. And the reason is they both have demonstrated usefulness to a degree, and we believe continuation of those would be probably one of the easiest steps that could be taken to promote innovation.

Chairwoman COMSTOCK. Dr. Langford?

Dr. LANGFORD. I would say continuity of support. I think one of the most disruptive things in our businesses and in innovation is where things get started and then a program gets stopped and restarted, whether it is in defense, it goes to the importance of having the defense budget and things like that. Continuity in the program, and you have done an excellent job of that, and I would encourage you to continue.

The other would just be educating people to the fact that the program exists and to its potential. I think there are still a lot of folks to be reached out there in the STEM programs, the next generations coming up, because this is such a fabulous opportunity for them to pursue their ideas, their dreams, their ambitions. And also in the government itself, because what we tend to find is that some people are very aware of the program and how to use it effectively and others have never heard of it or don't pay much attention to it. So education about the program and the access to it.

Mr. SHRODER. I would say the reporting. I believe that the Phase III success path could be dramatically increased if Congress understood the Phase III results that are coming out. And right now, you are kind of hamstrung with no ability to see the reports that are there.

When you guys have asked for the Phase III aspects, we have literally had Defense Department organizations call us and say: Do you have customers that want your technology, because we need to award a Phase III to align with the congressional requirements?

So if you can get that 3 percent to put together the reporting aspects, and I will call it the recognition of what the Phase III is about, I think the jobs and economic growth will come naturally.

Ms. ALBAN. For me, I think it is continuation in funding, that is one of the most important things. And then also partnership between R&D and acquisition, at least in terms of the DOD, and educating both sides of that to be able to work together and facilitate that transition.

Dr. RUBIN. I think any way that you can harness the university research pool to bring out innovation, like the Phase 0 programs, to continue and even expand and deepen the funding of them would be very, very powerful ways to bring out technologies that otherwise would never see the light of day.

We academics were a resistant, ornery group of people, and I think that cultural shifts are hard for us. But I think it is opportunities like this where we actually realize that our science matters.

Chairwoman COMSTOCK. Great. Thank you so much. I appreciate all the comments.

Chairman KNIGHT. Thank you very much.

And we are going to do a little bit of chair shuffling here. I have to take a meeting in just a couple minutes. So I am going to ask

the ranking member to ask her questions and have Mr. Estes come up and take over for just a few minutes.

Mrs. MURPHY. Thank you.

Ms. Albán, many small businesses have complained that the current SBIR application process is very arduous and costly. And in fact in your testimony you talked a bit about how in some cases filling out the application costs more than the amount businesses would receive in funding.

In other instances, the wait is just simply too long, that research staff might leave to work on other projects. It is hard to sustain that, especially if you are a small business.

What would you change in the SBIR program to help alleviate some of this hardship and specifically for women- and minority-owned businesses?

Ms. ALBÁN. Thank you for the question.

I definitely think that the part of the process that takes the longest is not so much the application process. It typically is when you have been notified that you have been selected for award, I don't know if it is the FAR or if it is the queue in which the contracting officers are working to get these contracts awarded. Sometimes it could take 6 to 12 months to get a contract awarded. So that is a pretty long period of time for you to wait, as you mentioned.

As far as it being costly, it is in the case of smaller businesses such as ours where we have to fortify or backfill the capabilities that we aren't as strong in, if you will, and we have to subcontract or to partner with universities. At times what is left for us is not enough for us to be able to actually make it a profitable venture and sometimes have to invest some of our own funding.

So I would like to see possibly a tailored version of the FAR or the ability for these contract awards to be expedited, because I think that would at least make a big difference or an impact for us.

Mrs. MURPHY. Thank you.

And then just one other follow-up on your testimony. You had talked a bit about the CR and sequestration and its impact. How does not having a Federal budget affect your ability to plan and run your business?

Ms. ALBÁN. Thank you for that question.

For us, it is extremely difficult, because we have to juggle the resources that we have to sometimes provide enough employment to keep them on staff, as you mentioned. And at times we have had to work and collaborate with other businesses and other projects to try to keep them employed in time for those contracts to be awarded.

We have a lot of phased efforts that are not necessarily SBIRs or STTRs in the R&D field that sometimes have to wait for the budget and for funding to come into the agencies in order for us to continue not new starts, but continue current efforts. So that is actually a big challenge for us. And currently, this summer I think is going to be a challenge for us. And, thankfully, this week we have gotten some good news. So I am very happy about that.

Mrs. MURPHY. Great. Thank you.

And this question is for the entire panel. Firms often face a disconnect when attempting to transfer their SBIR technologies to ac-

quisition programs. If agency procurement officers were more directly involved, there could be a better match between SBIR research and an agency's need.

Wouldn't it make sense to directly incorporate acquisition personnel into the SBIR programs in terms of research solicitation and technical assistance?

Mr. CLANTON. From our standpoint, I agree with that strongly. I think that is one of the biggest gaps in understanding the value of the SBIR program, is that of acquisition officers, who are accustomed to the day in and day out acquisitions of pencils and paper clips, now having something special coming out of the SBIR program, and I think their inclusion and their understanding earlier in the process would be a big benefit.

Dr. LANGFORD. I would agree with that. I think the contracting process is one of the most challenging parts of the Federal Government in general. And if you wanted to focus on one thing that would promote efficiency, it would be there.

The Air Force, it is like 300 days on sole source awards between the time that they can make a selection and get a contract done, and they are proud of that number because it has been coming down. It is just staggering to people on the private sector side.

So, yes, contracting efficiency both in SBIR, where we tend to be sort of the low priority compared to some of the larger awards, is huge, but it goes across the entire system.

Mr. SHRODER. You asked the question this morning to our government counterpart, and I think it was critical. And the key is, the acquisition people have learned the SBIR program through ones and twos. And the rules that are there, as I said earlier, just are not the same.

And so when you go, even if you—I hope you do bring them into the process, but when you do, you really need to educate them as to what the law says. Because when you start talking about major dollars, sole source, Phase III, et cetera, it is good that their reaction is, "Wait a minute, we can't do sole source, we don't have that authority," or whatever. Well, yes, you do. And the sooner you bring them in, the less the delays will be, because we spend a great amount of time educating the community what is legally allowed.

Ms. ALBÁN. And I will ditto that. It is definitely an issue of culture. I think it would be extremely helpful to have acquisition involved in the R&D process, especially since they are directly investing in a sense. I think that there would be a lot less resistance to doing so, and I think, certainly, that there would be a lot more advancement even in the technology and integration into the platforms.

Dr. RUBIN. Just so everyone knows, I don't know what an acquisition officer is, but I will say that the funding agency for us is actually NIH. You had the foresight to enable NIH to oversee the NCAI and the REACH program. And not only have they been very, very effective partners and mentors for this, they have actually synthesized across all institutes to fund these programs.

So in reality, it is a reflection of everyone's commitment to seeing these technologies move forward. So if NIH is my acquisition officer, I think they are great.

Mrs. MURPHY. Well, it sounds like we are in violent agreement about needing to address this gap.

And I yield back the remainder of my time. Thank you.

Mr. ESTES. [Presiding.] Thank you.

Mr. Shroder, in your experience how many technologies need an additional Phase II process and how many go straight to commercialization are there?

Mr. SHRODER. For our Phase II's, what we have found is the ones that do get a second Phase II, those are the ones that are really ripe for the Phase III commercialization. We have had six Phase III awards within the last couple of years and most of those, I think, related to ones that had received multiple Phase II awards.

So that extra investment from a venture capital perspective has been critical, because it also gives you the time to communicate the value of the technology to the rest of the world. We are not going to rely, necessarily, on the POM to fund the Phase III commercialization. We think it is our job to go get those customers and line them up.

But once we have shown the technology is worthwhile, and it has matured enough that they can trust it, we think they will invest the dollars that are already there to use it. Now we just need the ability for them to use it through the contracting officers.

Mr. ESTES. I will maybe open this to other members of the panel. Do you have similar or have comments around that question?

Dr. LANGFORD. My comment would be, just so you know how it works in the real world on Phase III's, they are often in our experience used just as contract vehicles and they often have little or no relationship to the Phase II because it is so hard to get a new contract established in the general contracting process that government authorities who want to get something done, one of their questions is, "Hey, do you have a Phase II open that we could put this onto as a Phase III?" And in our experience, that has been the primary way Phase III's get used.

Mr. ESTES. Which, actually, goes back to the ranking member's question previously about the contracting.

Dr. LANGFORD. It goes back to Representative Murphy's point exactly. I wouldn't say that is an abuse of the system, it is just how the system gets used, because the mainline contracting process is so cumbersome that people on both sides of the table are looking for ways that are fully within the law to get things done.

Mr. ESTES. Which is an interesting point. And kind of my background prior to running for public office was try to look for ways to make things more efficient and effective. So that is one of the reasons why I ran for office, was to look to do some of these things.

Dr. LANGFORD. Thank you. Thank you on behalf of all of us.

Mr. ESTES. Thank you.

I would like to call on Ranking Member Lipinski now.

Mr. LIPINSKI. Thank you.

Dr. Rubin, you talked very eloquently about how helpful the NIH REACH program has been. Is there anything that you would like to see change, any improvements that you would suggest to that program?

Dr. RUBIN. Thanks for the question and the support for REACH. I think that, if I remember the application process through an NIH RFA, there were a lot of universities entrusted in this mechanism, the idea of taking their science and seeing it come out into the real world.

So the easy answer to your question is to expand the program, because I think that all the universities across the country, if we rely only on those faculty who are protecting their discoveries with intellectual property and relying on tech transfer officers to move it out into the real world, we are just missing a huge opportunity from the investment the Federal and State governments make in our research enterprise.

So I would encourage your Committee to consider ways of expanding the program both in terms of breadth across the country, but also in terms of time. And the NIH REACH and NCAI programs are biomedical in their very phenotype, their definition. And the problem with biomedical challenges is it takes a long time to go from proof of concept translated to applied science into the commercial sector.

So having a little more, a longer leash, I think, would be very important to us. I think we are fully accountable. We are very milestone driven. NIH has been a good shepherd, but also good keeping us on track.

So I think that if I were to do anything, if I were sitting in your shoes, I would see if the power of the university environment could be expanded dramatically by expanding the program.

Mr. LIPINSKI. And do you think that this could be expanded into other areas across SBIR, not just through NIH? And that is your area, but can you see this easily translated all across?

Dr. RUBIN. I think it would just be a superb way of taking all the great engineering science outside of the biomedical field, material science, thin film, and software. These are, again, it is research that we as taxpayers are investing in. I am very proud of the innovation of our country and of our universities.

But I am frustrated a little bit by the absence of a cultural shift within our university communities to recognize the potential that is there. And I think that not so much a stick, but the carrot of expanding the program to other disciplines, I think would have a profound impact on the universities as economic engines in our communities.

So, yeah, I would applaud that as a great idea.

Mr. LIPINSKI. And do you have any experience or also anything to say about the role of I-Corps, something else that I had mentioned in the opening, about potentially having accelerators or have that be part of Phase II in SBIR? Do you think that would be helpful?

Dr. RUBIN. Well, I would just suggest to members of the Committee that I am an academic, so I have something to say about anything. So for sure.

Mr. LIPINSKI. I understand that. I am an academic myself.

Dr. RUBIN. I should also point out that in addition to the REACH program through NIH, we were very fortunate to secure an NSF I-Corps program as well as a Department of Commerce i6 Challenge, which is basically the synthesis of many distinct Fed-

eral agencies to move forward entrepreneurialism. And I think that as members and statements from this desk have been made about who are the future entrepreneurs, it is the I-Corps program not only for the faculty entrepreneurs, but the graduate students and undergraduates that are interested in seeing their science move out to the commercial sector.

So I think the fusion, the synthesis of these distinct programs really has great potential for the future. I think they are great, and we were very fortunate to secure these awards.

Mr. LIPINSKI. Thank you.

And I am almost out of time, so I yield back.

Mr. ESTES. Thank you.

And now Representative Lawson, you have 5 minutes.

Mr. LAWSON. Thank you very much, Mr. Chairman.

And you all, welcome to the Committee. And during the ones that testified before you, I asked a question that I will probably ask the same question, because I have a great deal of interest in it.

I represent probably three or four universities within the district. One of the major universities is Florida State University, which has a hub in Innovation Park and the home of the magnetic lab, which is very significant. And I am happy to see that the State of Florida reinvested in the lab, because there were other States around that were very interested in providing the funding that it needed to keep the lab going.

So the question centers around pipeline to Historically Black Colleges to get involved in STEM. There are two, one is in my district, which is Edward Waters College and the other is Florida A&M University, which is in the State university system. And we have a joint program in engineering between Florida A&M University and Florida State University which has gone on for a number of years, and they are producing more students that are candidates to be involved in the STEM field.

My question: Can we create that pipeline for graduates in the STEM field that would help these students create their own small businesses that can eventually take part in programs such as SBIR and STTR? And that is for the whole panel.

Ms. ALBAN. Congressman Lawson, I can tell you that at the University of Central Florida in Orlando there is such a program for students. It is called LaunchPad, I believe, the Blackstone LaunchPad. And I recently actually went and spoke to a group of students to talk to them about all the opportunities in what we call our ecosystem for entrepreneurs. And the University of Central Florida is doing a very good job of not just creating entrepreneurs, but also entrepreneurs within the STEM field.

I could find that information out for you and certainly get it to you, but I know that it has been a very successful program. And a lot of those students as they graduate then transition into the incubator program that the university also has, which then also educates them on how to write the proper proposal for the STTR and SBIR program and how to pursue even the Phase 0's, the Phase I's, and the Phase II's. So I would be happy to share that information with you.

Mr. LAWSON. Okay. That is great.

Anyone else care to elaborate on that?

Mr. CLANTON. We do a lot of collaboration with Texas A&M University, and through both their engineering and business school they have a number of outlets for new ventures in entrepreneurship, very similar to what Ms. Albán was saying. And we have also been encouraging the discussion of some type of mentor protege program specifically for SBIR companies to help young, first-time business owners with SBIR applications in the process.

Mr. LAWSON. Okay. And I just have one other question, because I heard you all talk about the application process. So if you had to recommend one thing to Congress about how long does it take to go through the contracting process, what would that be?

Mr. SHRODER. Metrics. I think if you had metrics that made you understand the speed or lack thereof in the reporting that comes through, you might guide it slightly differently. Because the reality is, I think we at one point mentioned that some awards have taken nearly a year. In those kinds of cases, I don't think that is at all what your intent is.

And when you are a small business and you have got some pretty high-tech people that you are blessed to have as employees sitting on your bench, if you don't have other work for them, by the time the award occurs, they are not even your employee anymore.

So if you could get your metrics to report each agency's performance along those lines, I think it would change the culture.

Mr. LAWSON. Yes. And, Mr. Chair, just before I yield back, I think that is very, very, very significant, and that we should with the staff try to find out how can we improve that process.

And I yield back.

Mr. ESTES. Thank you.

Well, I will make a closing statement now. Again, I would like to thank all our witnesses for being with us today. I think both panels provided us with some excellent thoughts on these successful programs.

Whether we are doing new software programs or tracking contract payments, a new medical device to help with cancer treatments, or a new piece of technology that might save lives on the battlefield, the SBIR and STTR programs have consistently delivered results across all Federal agencies. They are worthy programs that are worthwhile and doing what they are supposed to do.

But we can always do better. We are going to take some of your suggestions and thoughts that you provided today and work to incorporate them into legislation that our two Committees are working on.

I do want to thank you for your testimony.

I will ask unanimous consent that the hearing record be open for 2 weeks for additional written comments and written questions from members. And without objection, so ordered.

This hearing is now adjourned.

[Whereupon, at 12:45 p.m., the Subcommittees were adjourned.]

APPENDIX

U.S SMALL BUSINESS ADMINISTRATION
WASHINGTON, D.C. 20416

WRITTEN TESTIMONY OF A. JOSEPH SHEPARD
ASSOCIATE ADMINISTRATOR FOR
OFFICE OF INVESTMENT & INNOVATION
U. S. SMALL BUSINESS ADMINISTRATION

THE SMALL BUSINESS INNOVATION RESEARCH (SBIR) & SMALL BUSINESS TECHNOLOGY TRANSFER (STTR) PROGRAMS

BEFORE THE SUBCOMMITTEE ON CONTRACTING AND THE WORKFORCE OF THE COMMITTEE ON SMALL BUSINESS & THE SUBCOMITTEE ON RESEARCH AND TECHNOLOGY OF THE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

MAY 4, 2017

Chairman Knight, Chairwoman Comstock, Ranking Member Murphy, Ranking Member Lipinski and distinguished members of the committees, thank you for inviting me here today to discuss the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs.

On March 22, 2017, SBA Administrator Linda McMahon announced my appointment as the SBA's Associate Administrator for the Office of Investment and Innovation. I am honored to have the opportunity to be at the SBA, and now make it my mission to ensure that we continuously improve our processes and look for innovative ways to deliver a quality product to all of our stakeholders.

Like SBA Administrator McMahon, I am firmly committed to improving the effectiveness, efficiency, and accountability of the SBIR/STTR programs. Since taking over the Office of Investment and Innovation I have dedicated myself to developing a deeper understanding for where America's Seed Fund is working and where we can make necessary improvements.

I am pleased to report a number of accomplishments that are already completed or underway here at the SBA. We are modernizing the program's systems, expanding outreach efforts, promoting inclusive innovation, and strengthening relationships outside as well as within the programs. With that, I'd like to describe to you today a few of the major accomplishments we made over the last couple of years but I must start by thanking the committees for your work in reauthorizing the programs in December 2011 and for extending the programs in 2016. We know these programs have a powerful and positive impact on our economy. Studies from the Air Force and Navy have shown that a relatively small investment made through the SBIR program results in new economic activity and the creation of many high-paying jobs each year – a worthy return on investment.

SBIR is a President Reagan-era program introduced to ensure that our nation's high-tech small businesses receive a portion of the federal R&D allocation. As far back as 1982 Congress understood the importance of providing early stage development funding to the entrepreneur. We have all seen the great success of whole new industries being formed by individuals with an idea and

a passion. Examples include the cell phone technology of Qualcomm to the advances in robotics and automation of iRobot to lifesaving medicines from Biogen/IDEC and MedImmune, and there are thousands of other successful firms across the country because of this catalytic program.

Illumina, a global leader in DNA sequencing and 2016 SBIR Hall of Fame recipient, received SBIR funding as a startup in 1999, which allowed them to develop higher-risk research positioned further from the market. These SBIR-funded projects resulted in core technology, enabling entirely new fields in life sciences, ultimately leading to the ability to sequence an entire human genome for $1000, enabling precision medicine and many new possibilities for human health. The company has grown to over 5000 employees, has a market cap over $26 billion and generated $2.2 billion of revenue in 2016.

SBIR funding is a transformational fuel that commercializes university research, generates new industries, creates an incredible number of new high paying jobs and ensures America is technologically competitive in the global marketplace. As the newly appointed Associate Administrator, I believe it's more critical than ever to support this program as it provides much needed seed funding to high tech small businesses across the United States, including areas beyond the major VC hubs of San Francisco, Boston, and New York.

Thanks to this committee, many of our outreach, engagement, digital presence, and oversight activities were enabled because of the 3% administrative funding pilot program included in the 2011 Reauthorization. This important pilot program expires in September 2017 and we urge these committees to strongly consider extending this program which has been a critical tool in allowing the agencies to carry out the many legislative improvements made to the program in 2011, such as efforts to strengthen and diversify the pipeline of innovation entering the SBIR/STTR programs. SBA has coordinated a successful outreach campaign to bring SBIR agency program managers out of Washington, DC and into our local communities through the SBIR Road Tour, Regional Summits, and National Conferences.

Over the last two years we have visited 27 states and by the end of this year it will be 52 stops in 35 states, including all states traditionally underserved in

federal R&D funding in the continental US. As I testify today, we are launching our 2017 Road Tours and there is a bus full of SBIR program managers in the Mountain West, visiting Idaho, Utah, Nevada, and Arizona. These efforts and those of participating agencies have collectively engaged 10,000 innovators across the US.

Universities have been a major partner in our outreach efforts. In fact, more than half of our outreach efforts have been in partnership with and at universities. The SBIR and STTR programs are an ideal tool for universities to commercialize their basic science discoveries and help to transition that public investment in those discoveries to the marketplace. Studies from the National Academies have shown that depending on the agency, 35-70% of SBIR projects and 95% of STTR projects had a university connection, and for NIH and NSF more than 80% of the SBIR firms had at least one academic founder. Over 350 different research institutions have been involved in SBIR projects. SBIR seed funding provides critical capital to allow academic discoveries to become products that improve people's lives.

SBA has also coordinated with NASA efforts to ensure that historically black colleges and universities (HBCUs) and other minority-serving institutions (MSIs) are aware of the opportunity to access the SBIR and STTR programs to translate technology from lab to market.

A particular priority for Administrator McMahon, and for many members of these respective committees, is to ensure women innovators are competing for SBIR and STTR awards. SBA continues to lead and support SBIR agency efforts to increase outreach and support to women entrepreneurs. This past October we held a Women SBIR Networking and Awareness Day at MIT which brought together 200 innovators, thought-leaders, and SBIR agencies.

Beyond outreach, SBA is working to ensure more agencies can learn from and adopt a program like the Department Of Energy's (DOE) Phase 0 Proposal Assistance Program, which provides targeted assistance for company formation and proposal writing to underrepresented communities, including small businesses owned by women, minorities, or located in states that have historically lower DOE funding. DOE was able to establish this program

using funding provided by the Administrative Funding Pilot and would not be able to fund this successful effort if the pilot expires.

SBA has modernized the SBIR.gov business intelligence platform and worked collaboratively with the 11 participating agencies to improve data collection needed for reporting purposes and for responding to GAO recommendations. Timely and accurate submission of reports is a key goal for our team. We will continue to work to ensure program accountability and serve as good stewards of our taxpayer dollars.

The SBA see's great value in all four of the pilot programs executed in the 2011 Reauthorization to include, Administrative Funding, Direct to Phase II, NIH Phase 0 Program, and the Civilian Agencies Commercialization Pilot Program. SBA recommends that all of these pilots be extended or made permanent.

The bottom line is that small businesses play a key role in developing our next generation of innovative products and ensuring a strong and growing economy. SBA plays a critical role in ensuring the 11 agencies set aside the proper funding, make their systems open to new firms, encourage women, minorities and those from underrepresented states to participate. Congress has handed the oversight authority of these programs to SBA and I look forward to working with you to improve our ability to provide the data and reports you need to ensure the program is being properly executed.

United States Government Accountability Office

GAO

Testimony
Before the Subcommittee on Contracting and the Workforce, Committee on Small Business, and the Subcommittee on Research and Technology, Committee on Science, Space and Technology, House of Representatives

For Release on Delivery
Expected at 9:00 a.m. ET
Thursday, May 4, 2017

SMALL BUSINESS RESEARCH PROGRAMS

Status of Prior Recommendations

Statement of John Neumann, Director,
Natural Resources and Environment

GAO Highlights

Highlights of GAO-17-594T, testimony before the Subcommittee on Contracting and the Workforce, Committee on Small Business, and the Subcommittee on Research and Technology, Committee on Science, Space and Technology, House of Representatives

Why GAO Did This Study

For about 35 years, federal agencies have made awards to small businesses for technology research and development through the SBIR program and, for the last 25 years, through the STTR program, totaling more than $40 billion. Currently, 11 agencies participate in the SBIR program, and 5 of these agencies also participate in the STTR program. The SBIR/STTR Reauthorization Act of 2011 included provisions for GAO to review aspects of the programs.

This statement addresses GAO's key findings and recommendations related to the SBIR and STTR programs since 2012. This statement is based on GAO reports issued in response to the act's provisions from November 2012 through April 2017. Those reports examined SBA's and agencies' compliance with spending and other reporting requirements for the programs and their implementation of fraud, waste, and abuse prevention measures. For those reports, GAO compared documentation from SBA and participating agencies with the respective requirements. In April 2017, GAO updated the status of its prior recommendations.

What GAO Recommends

GAO has made 17 recommendations to SBA to improve oversight and implementation of the SBIR and STTR programs. SBA generally agreed with the recommendations. SBA has taken or described planned actions to address the recommendations, which GAO will continue to monitor.

View GAO-17-594T. For more information, contact John Neumann at (202) 512-3841 or neumannj@gao.gov.

May 2017

SMALL BUSINESS RESEARCH PROGRAMS

Status of Prior Recommendations

What GAO Found

The Small Business Administration (SBA), which oversees the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs, and agencies participating in the programs have implemented about one-third of GAO's 20 prior recommendations regarding the programs. From September 2013 through April 2017, GAO made 17 recommendations to SBA and 3 to participating agencies to improve the oversight and implementation of spending requirements; reporting requirements; the administrative pilot program; and fraud, waste, and abuse prevention requirements. SBA has implemented 5 recommendations, and participating agencies have implemented 1 (see figure), although GAO made 4 of these recommendations to SBA and 2 to participating agencies in April 2017.

Number and Percentage of Prior GAO Recommendations Implemented as of April 2017

Agency	Number of recommendations	Number of recommendations implemented	Percentage of recommendations implemented
Small Business Administration	17	5	29
Department of Health and Human Services	2	1	50
Department of Defense	1	0	0
Total	20	6	30

Source: GAO | GAO-17-594T

SBA and participating agencies have taken some actions to address GAO's recommendations. For example, in June 2014, GAO recommended that SBA clarify how agencies are to submit data on allowable spending. In response, SBA revised its annual report template, requesting that agencies identify obligations for the programs outside of awards. This change has improved the accuracy of the data that agencies report to SBA. However, SBA and the participating agencies have not fully implemented 14 recommendations that, if implemented, could improve the oversight and implementation of the programs. For example, in each of its four reports on agencies' compliance with spending and other reporting requirements, GAO found that SBA had not submitted required annual reports to Congress on the programs. SBA issued its most recent required report on the programs for fiscal year 2013 in March 2016. In a September 2013 report, GAO concluded that without more rigorous oversight by SBA and more timely and detailed reporting, it would be difficult for SBA to ensure that intended benefits of the programs were being attained and that Congress was receiving critical information to oversee these programs. GAO recommended that SBA provide Congress with a timely annual report, as required by the act. SBA agreed and stated that it planned to implement the recommendation. However, SBA has not yet done so and, as of April 2017, SBA did not have an estimated date for submitting its reports for fiscal years 2014 through 2016. GAO continues to believe that it is important for SBA to provide a timely annual report to Congress to further improve oversight of the programs.

Chairman Knight, Chairwoman Comstock, Ranking Members Murphy and Lipinksi, and Members of the Subcommittees,

Thank you for the opportunity to discuss our work on the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs. For about 35 years, federal agencies have made awards to small businesses for technology research or research and development (R&D) through the SBIR program and, for the last 25 years, through the STTR program. Federal agencies have awarded an average of about $2 billion a year through these programs and a total of more than $40 billion for 150,000 contracts and grants since their inception in 1982 and 1992, respectively. Currently, 11 agencies participate in the SBIR program, and 5 of these agencies also participate in the STTR program, as shown in table 1.

Table 1: Agencies Participating in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs

	Program	
Agency	**SBIR**	**STTR**
Department of Agriculture	X	
Department of Commerce	X	
Department of Defense	X	X
Department of Education	X	
Department of Energy	X	X
Department of Health and Human Services	X	X
Department of Homeland Security	X	
Department of Transportation	X	
Environmental Protection Agency	X	
National Aeronautics and Space Administration	X	X
National Science Foundation	X	X

Source: Small Business Administration. | GAO-17-594T

Each participating agency is to manage its SBIR and STTR programs in accordance with program laws and regulations and the policy directives issued by the Small Business Administration (SBA), which oversees the

two programs.[1] Federal agencies with obligations of $100 million or more for extramural R&D are required to establish and administer an SBIR program, and federal agencies with obligations of $1 billion or more for extramural R&D are also required to establish and administer an STTR program.[2] The Small Business Act, which authorizes the programs, establishes the amount of an agency's funding that must be spent on the SBIR and STTR programs each year.[3] In fiscal year 2017, agencies participating in the SBIR program are required to spend at least 3.2 percent of their extramural R&D obligations on the program, and agencies participating in the STTR program are required to spend at least 0.45 percent of their extramural R&D obligations on the program.

The SBIR/STTR Reauthorization Act of 2011 (reauthorization act) included provisions for us to review aspects of the SBIR and STTR programs.[4] In response to those provisions, we have issued four reports on SBA and agencies' compliance with spending and other reporting

[1]SBA's Office of Investment and Innovation is responsible for overseeing and coordinating the participating agencies' efforts for the SBIR and STTR programs by setting overarching policy and issuing policy directives; collecting program data; reviewing agency progress; and reporting annually to Congress, among other responsibilities.

[2]Agencies' R&D programs generally include funding for two types of R&D: intramural and extramural. Intramural R&D is conducted by employees of a federal agency in or through government-owned, government-operated facilities. Extramural R&D is generally conducted by nonfederal employees outside of federal facilities.

[3]The Small Business Act requires a minimum percentage of an agency's extramural R&D "budget" to be spent on the programs annually, but it defines the extramural R&D budget in terms of obligations. More specifically, the act defines an agency's extramural R&D budget as the sum of an agency's total R&D obligations minus amounts obligated for research conducted by employees of the agency in or through government-owned and government-operated facilities. In 2014, SBA changed the terminology it uses from "extramural R&D budget" to "extramural R&D obligations" to clarify how agencies are required to calculate their spending requirements for the programs. In this statement, we generally use the term extramural R&D obligations to be consistent with SBA's terminology. We use the term "spending" to refer to agencies' obligations for extramural R&D efforts, including those for the SBIR and STTR programs, and we refer to the amounts resulting from applying the mandated percentages to extramural R&D obligations as "spending requirements."

[4]SBIR/STTR Reauthorization Act of 2011, Pub. L. No. 112-81, div. E, tit. LI, §§ 5001-5168, 125 Stat. 1298, 1822-62 (codified at 15 U.S.C. §§ 638-638b (2017)).

requirements for the programs,[5] and two reports on SBA and agencies' implementation of fraud, waste, and abuse prevention measures.[6]

This statement describes our key findings and recommendations related to the SBIR and STTR programs since 2012 and actions taken to address those recommendations. This statement is based on our prior reports on the SBIR and STTR programs issued from November 2012 through April 2017. For those reports, we reviewed documentation from SBA and the participating agencies and interviewed officials from SBA and the participating agencies. We compared documentation from SBA and the participating agencies with their respective requirements. Our prior reports include detailed information on the methods used to conduct our prior work. In April 2017, we consulted with agencies on the current status of open recommendations and updated our prior recommendations.

We conducted the work on which this statement is based in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

The SBIR program was initiated in 1982 and has four purposes: (1) to use small businesses to meet federal R&D needs, (2) to stimulate technological innovation, (3) to increase commercialization of innovations derived from federal R&D efforts, and (4) to encourage participation in technological innovation by small businesses owned by disadvantaged individuals and women. The purpose of the STTR program—initiated in

[5]GAO, *Small Business Research Programs: Actions Needed to Improve Compliance with Spending and Reporting Requirements*, GAO-13-421 (Washington, D.C.: Sept. 9, 2013); *Small Business Research Programs: More Guidance and Oversight Needed to Comply with Spending and Reporting Requirements*, GAO-14-431 (Washington, D.C.: June 6, 2014); *Small Business Research Programs: Challenges Remain in Meeting Spending and Reporting Requirements*, GAO-15-358 (Washington, D.C.: Apr. 15, 2015); and *Small Business Research Programs: Agencies Have Improved Compliance with Spending and Reporting Requirements, but Challenges Remain*, GAO-16-492 (Washington, D.C.: May 26, 2016).

[6]GAO, *Small Business Research Programs: Agencies Are Implementing New Fraud, Waste, and Abuse Requirements*, GAO-13-70R (Washington, D.C.: Nov. 15, 2012) and *Small Business Research Programs: Additional Actions Needed to Implement Fraud, Waste, and Abuse Prevention Requirements*, GAO-17-337 (Washington, D.C.: Apr. 25, 2017).

1992—is to stimulate a partnership of ideas and technologies between innovative small businesses and research institutions through federally funded R&D. The SBIR and STTR programs are similar in that participating agencies identify topics for R&D projects and support small businesses, but the STTR program requires the small business to partner with a research institution—such as a nonprofit college or university or federally funded R&D center.[7] The programs are currently authorized through fiscal year 2022.[8]

The SBIR and STTR policy directives require participating agencies to submit data to SBA each year on the amount of their extramural R&D obligations and the amount obligated for awards, among other information. The Small Business Act also establishes certain reporting requirements for participating agencies and SBA. Among other things, agencies must, within 4 months of the enactment of their annual appropriations, report to SBA on their methodologies for calculating their extramural R&D obligations. Furthermore, SBA must annually report to Congress on the participating agencies' SBIR and STTR programs. Additionally, the reauthorization act directed SBA to allow agencies to participate in a pilot program, known as the administrative pilot program, which permitted the funding of administrative and certain other costs in fiscal years 2013 through 2015.[9] Under this administrative pilot program, agencies are allowed to use not more than 3 percent of the funding allocated to the SBIR program for new activities, including program administration; outreach; commercialization; standardization and simplification of program procedures; prevention of waste, fraud, and abuse; and congressional reporting. The SBIR and STTR policy directives specifically note that funding under the pilot program may not replace current agency administrative funding for SBIR or STTR activities. Instead, the administrative pilot program is intended to supplement existing administrative efforts. In November 2015, the National Defense Authorization Act for Fiscal Year 2016 extended the pilot program through

[7]Federally funded R&D centers are government-funded entities operated by nongovernmental organizations to meet long-term research or development needs that cannot be met as effectively by existing governmental or contractor resources. These entities typically assist government agencies with scientific research and analysis, systems development, and system acquisition.

[8]National Defense Authorization Act for Fiscal Year 2017, Pub. L. No. 114-328, § 1834 (2016).

[9]SBIR/STTR Reauthorization Act of 2011 § 5141 (codified as amended at 15 U.S.C. § 638(mm) (2017)).

September 30, 2017.[10] In December 2016, the National Defense Authorization Act for Fiscal Year 2017 extended the SBIR and STTR programs through fiscal year 2022, but did not extend the pilot program.[11]

The reauthorization act required SBA to add fraud, waste, and abuse prevention requirements to the policy directives for agencies to implement.[12] In 2012, SBA issued revised policy directives for the SBIR and STTR programs that included new requirements designed to help agencies prevent potential fraud, waste, and abuse in the programs. In addition to the requirements for the participating agencies, the reauthorization act included requirements for those agencies' Offices of the Inspectors General (OIG).[13]

SBA and Participating Agencies Have Implemented About One-Third of Our Prior Recommendations

SBA has implemented 5 of the 17 recommendations we have made on the SBIR and STTR programs and the participating agencies to which we have made recommendations—the Departments of Health and Human Services (HHS) and Defense (DOD)—have implemented 1 of the 3 recommendations we made. From September 2013 through April 2017, we made recommendations to SBA and participating agencies to improve oversight and implementation of the programs in four areas: (1) spending requirements; (2) other reporting requirements; (3) the administrative pilot program; and (4) fraud, waste, and abuse prevention requirements. The complete list of recommendations and the status of agencies' implementation of the recommendations is included in appendix I.

HHS Implemented Recommendation on Spending Requirements, and SBA Implemented Half of Recommendations Related to Those Requirements

From September 2013 through April 2017, we made six recommendations to SBA and one to HHS to improve oversight and implementation of the SBIR and STTR spending requirements. SBA has fully implemented three of these recommendations and HHS has implemented its recommendation in this area (see app. I). Some actions that SBA and HHS have taken to address our recommendations include the following:

[10]National Defense Authorization Act for Fiscal Year 2016, Pub. L. No. 114-92, § 873(e), 129 Stat. 726, 939 (2015) (codified at 15 U.S.C. § 638(mm)(1) (2017)).

[11]National Defense Authorization Act for Fiscal Year 2017, Pub. L. No. 114-328, § 1834 (2016).

[12]SBIR/STTR Reauthorization Act of 2011§ 5143(a)(1).

[13]SBIR/STTR Reauthorization Act of 2011 § 5143(a)(5).

- In certain circumstances, amounts that the agencies spend for items other than awards count as part of the agencies' spending for the programs. In our June 2014 report, we found that SBA did not request that agencies submit data on such spending and recommended that the agency clarify how to submit such data.[14] In response to our recommendation, SBA revised its annual report templates for data reported since fiscal year 2013 to identify obligations for the programs outside of awards, such as funds spent on discretionary technical assistance to small businesses. This change has improved the accuracy of participating agencies' obligations data that they report to SBA and that SBA, in turn, reports to Congress.
- In our September 2013 report, we found that SBA did not request that agencies include information in their annual reports that would enable SBA to conduct better oversight, including information on (1) whether agencies met the mandated spending requirements, (2) the reasons for any noncompliance with these requirements, and (3) the agencies' plans for attaining compliance in future years.[15] We recommended that SBA direct participating agencies to include this information in their annual reports to SBA. In response, SBA updated the annual report template to request this information starting in fiscal year 2015, which should help SBA more fully oversee the programs and provide more complete information to Congress.
- In our June 2014 report, we found that HHS used different extramural R&D budget data to calculate its SBIR and STTR spending requirements.[16] We recommended that HHS include all of its extramural R&D budget in the calculation of STTR spending requirements and in the data submitted to SBA to help ensure that the agency spends the required amount for the STTR program. According to program documents and agency officials, HHS included all of its extramural R&D in its budget data for the STTR program beginning with its annual report for fiscal year 2014, which was submitted in March 2015.

SBA has not yet fully implemented three of our recommendations related to the spending requirements. For example, in our May 2016 report, we found that USDA's extramural R&D obligations exceeded the threshold for participating in the STTR program, but USDA did not start an STTR

[14]GAO-14-431.

[15]GAO-13-421.

[16]GAO-14-431.

program.[17] For that report, USDA officials told us that they did not establish an STTR program because they did not expect their extramural R&D obligations to exceed $1 billion in fiscal year 2014 and that they believed the agency's obligations were an anomaly. Further, because the spending requirement is based on actual obligations, which cannot be known until after the end of the fiscal year, USDA was unaware of its actual obligations until it was too late to retroactively begin an STTR program. Although the Small Business Act is clear about the dollar threshold for starting an SBIR or STTR program, neither the law nor SBA's guidance specifies when an agency should establish a program—for example, at the beginning of the year, partway through the year, or at the end of the year. We recommended that SBA review its guidance regarding when an agency is required to start up an SBIR or STTR program, and if necessary, update the guidance to provide greater clarity to agencies. SBA agreed with our recommendation and, as of April 2017, SBA officials said they were working to develop language to update SBA's policy directives to provide guidance on when an agency must start an SBIR or STTR program. We continue to believe that fully implementing this recommendation is important because such information may help ensure that agencies will establish programs when required and ensure that the required amount of money is available for small businesses participating in the programs.

SBA Implemented One of Five Recommendations to Improve Compliance with Other Reporting Requirements

The Small Business Act requires SBA to report annually to Congress on the programs and requires participating agencies to report to SBA within 4 months of the enactment of appropriations on their methodologies for determining their extramural R&D budgets. We have made five recommendations to SBA to improve compliance with these reporting requirements. SBA has fully implemented one recommendation (see app. I), but four remain open. For example:

- In each of our four reports on agencies' compliance with spending and other reporting requirements, we found that SBA had not submitted timely reports to Congress on the SBIR and STTR programs. The Small Business Act requires SBA to report to certain congressional committees on the SBIR and STTR programs not less than annually. SBA issued its most recent required report to Congress on the SBIR and STTR programs for fiscal year 2013 in March 2016. In our September 2013 report, we concluded that without more rigorous oversight by SBA and more timely and detailed reporting on the part

[17]GAO-16-492.

of both SBA and participating agencies, it would be difficult for SBA to ensure that intended benefits of the SBIR and STTR programs were being attained and that Congress was receiving critical information to oversee these programs.[18] In that report, we recommended that SBA provide Congress with a timely annual report that includes a comprehensive analysis of the methodology each agency used for calculating the SBIR and STTR spending requirements. SBA agreed and stated at the time that it planned to implement the recommendation. SBA officials told us that they have taken some steps to help them develop the required reports to Congress, but have not submitted SBA's reports for fiscal years 2014, 2015, or 2016. We continue to believe that it is important for SBA to provide a timely annual report to Congress to further improve oversight of the programs.

- In our September 2013 report, we found that agencies submitted different levels of detail on their methodologies in their required reports to SBA.[19] In that report, we recommended that SBA provide agencies with additional guidance on the format to use for methodology reports. Further, we found in our April 2015 report that, as a result of the varying detail that agencies provide in their methodology reports, it was difficult for SBA to complete its required analysis of the methodology reports.[20] We recommended that SBA assess and update, if needed, the methodology reporting requirement to ensure it generates adequate information. In response to that recommendation, SBA proposed expanded guidance to agencies. However, the proposed guidance has not yet been finalized. According to SBA officials, SBA withdrew the draft policy directive from Office of Management and Budget consideration in January 2017 and it is under further internal consideration in light of a recent executive order. Without finalizing the proposed guidance, participating agencies are likely to continue to provide SBA with broad, incomplete, or inconsistent information on their methodologies for calculating their extramural R&D and SBA cannot ensure that it is able to provide Congress with an accurate analysis of how agencies calculate their extramural R&D. Additionally, in our September 2013 report—and others—we found that SBA had not consistently provided feedback to agencies on the content of their methodology reports, and

[18]GAO-13-421.

[19]GAO-13-421.

[20]GAO-15-358.

recommended that SBA provide timely annual feedback to agencies on whether their methods for calculating their extramural R&D budgets complies with program requirements. We concluded that, without such review and feedback, agencies may be calculating their extramural R&D incorrectly, which could lead to their spending less than the required amounts on the programs. We continue to believe that updating its guidance on information to include in the methodology reports and providing feedback to agencies on their methodologies could help SBA ensure that agencies are spending the required amounts on the SBIR and STTR programs.

SBA Has Implemented One of Two Recommendations Relating to the Administrative Pilot Program

Since fiscal year 2013, agencies have been allowed to spend some of their SBIR funding for certain administrative costs related to the programs. We have made two recommendations to SBA to improve its oversight of the administrative pilot programs. SBA has implemented one of the two recommendations.

In our April 2015 report, we found that for fiscal year 2013, SBA had requested that agencies submit information on the total amounts spent on the administrative pilot program, but it did not request agencies to submit information on how they used the funds.[21] Fiscal year 2013 was the first year of the pilot program, and, as we found in that report, SBA officials were still determining the information they needed to report to Congress. We recommended that SBA require participating agencies to provide data on the use of the funds, rather than a total cost for all of the activities under the pilot. In response, SBA updated the annual report template used to collect program data from the agencies for fiscal year 2014, which was submitted in the spring of 2015, to collect this information. This improved the information available to SBA on the amounts spent on activities through the administrative pilot program.

In our May 2016 report, we found that participation in the administrative pilot program had increased in fiscal year 2014 compared with prior years, but agency officials identified potential constraints that limited their participation, including the temporary nature of the program and the requirement to expend funds only on new activities.[22] SBA is required to collect data and report on the use of funds to achieve the objectives of the

[21]GAO-15-358.

[22]GAO-16-492.

administrative pilot program, but had not yet submitted a report.[23] We recommended that SBA complete its required evaluation of the administrative pilot program, which could include an evaluation of the constraints that have hindered agencies' participation in the administrative pilot program and steps to address these constraints. SBA has not submitted a report to Congress on the administrative pilot program for fiscal year 2014. We continue to believe that having SBA include an evaluation of potential constraints to participating in the administrative pilot program, whether as part of the annual report or in a separate report, could be useful if Congress decides to continue the program in the future. We concluded that, without such information, SBA and Congress will not have the information they need to address the constraints and help ensure agencies are implementing the administrative pilot program to the fullest extent if Congress chooses to extend the pilot program beyond fiscal year 2017.

SBA and DOD Plan to Implement April 2017 Recommendations on Fraud, Waste, and Abuse Prevention Requirements

In our April 2017 report on the SBIR and STTR programs, we reviewed the implementation of fraud, waste, and abuse prevention measures by SBA and the participating agencies and their OIGs. SBA amended the SBIR and STTR policy directives in 2012, as required by the reauthorization act, to include 10 minimum requirements to help agencies prevent potential fraud, waste, and abuse in the programs. In that report, we found that the extent to which the participating agencies have fully implemented each of the 10 minimum requirements varies.[24] We made four recommendations to SBA and recommendations to HHS and DOD to improve implementation of the requirements (see app. I). HHS disagreed with our recommendation, but we continue to believe the recommendation is valid and should be implemented.[25] SBA and DOD plan to implement all of their recommendations. For example:

- We found that SBA had taken few actions to oversee agencies' implementation of the policy directives' minimum requirements to address fraud, waste, and abuse in the SBIR and STTR programs. SBA officials said they checked on the implementation of one of the requirements but did not know whether the participating agencies were implementing the other requirements because they had not confirmed this information. We concluded that, without confirming that

[23] 15 U.S.C. § 638(mm)(6) (2017).

[24] GAO-17-337.

[25] See appendix I and GAO-17-337 for additional information.

each participating agency is implementing the fraud, waste, and abuse prevention requirements in the policy directives, SBA did not have reasonable assurance that each agency has a system in place to reduce its' vulnerability to fraud, waste, and abuse. SBA agreed with the recommendation and stated that it will request that each participating agency confirm its implementation of the minimum fraud, waste, and abuse prevention requirements.

- Although SBA updated the SBIR and STTR policy directives in 2012 to include the fraud, waste, and abuse prevention requirements, SBA officials said they have not taken action since 2012 to review them to determine whether they are effective or whether any revisions are needed. We identified requirements that some agency officials said were not clear or may be unnecessary, and we recommended that SBA review all of the SBIR and STTR fraud, waste, and abuse prevention requirements and clarify any that are unclear. SBA stated it will contact all agencies to inquire if additional clarity is needed regarding any of the fraud, waste, and abuse requirements, and will provide additional guidance, if necessary.
- We found that SBA had not evaluated the outcomes of the agencies' implementation of the fraud, waste, and abuse prevention requirements and therefore did not have reasonable assurance that the requirements are necessary, appropriate, and meet the intended purpose of preventing fraud, waste, and abuse in the SBIR and STTR programs. We recommended that SBA ensure that the requirements are appropriate and meeting their intended purposes. In response to that recommendation, SBA stated that it would survey the participating agencies regarding whether the requirements are necessary and meeting their intended purposes; are placing undue burdens on the agencies; or need to be revised, updated, or eliminated.

We look forward to reviewing the agencies' progress in implementing these important recommendations.

Chairman Knight, Chairwoman Comstock, Ranking Members Murphy and Lipinksi, and Members of the Subcommittees, this completes my prepared statement. I would be pleased to respond to any questions that you have.

GAO Contact and Staff Acknowledgments

If you or your staff have any questions about this testimony, please contact John Neumann, Director, Natural Resources and Environment at (202) 512-3841 or neumannj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. Individuals making key contributions to this statement included Hilary Benedict (Assistant Director), Antoinette Capaccio, Rebecca Makar, and Kiki Theodoropoulos.

Appendix I: GAO's Prior Recommendations on Small Business Research Programs

Table 2 lists our prior recommendations to the Small Business Administration (SBA) and the agencies participating in the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs, and the status of those recommendations, in four areas: (1) spending requirements, (2) other reporting requirements, (3) the administrative pilot program, and (4) fraud, waste, and abuse prevention requirements.

Table 2: GAO Reports Containing Recommendations on the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs by Category and Status of Recommendations

Category and recommendation	Report number	Status
Spending requirements		
Recommendation to: Small Business Administration (SBA) To ensure that participating agencies and SBA comply with spending and reporting requirements for the SBIR and STTR programs, the SBA Administrator should provide additional guidance on how agencies should calculate spending requirements when agency appropriations are received late in the fiscal year and the format agencies are to include in their methodology reports.	GAO-13-421	Open According to SBA officials, the timing of appropriations does not affect how agencies should calculate their spending requirements. We believe that the existing guidance on calculating spending requirements addresses the first part of this recommendation. In response to our recommendation, SBA updated its annual report template, which asked agencies to provide certain information for their methodology reports as part of their annual reports. The revised template was used for the fiscal year 2013 data that agencies reported to SBA in June 2014 and similar information was requested for fiscal year 2014. Further, SBA's proposed program policy directive, published in the Federal Register in April 2016, included additional information that agencies are to include in their methodology reports. However, according to SBA officials, in January 2017, the policy directive was withdrawn from the Office of Management and Budget and is under further internal consideration in light of a recent executive order. As of April 2017, SBA has not established a time frame for publication of the final policy directive.
Recommendation to: SBA To ensure that participating agencies and SBA comply with spending and reporting requirements for the SBIR and STTR programs, the SBA Administrator should direct participating agencies to include in their annual reports the calculation of the final extramural research or research and development (R&D) budget used as the basis for their SBIR and STTR spending requirements and, if they did not meet the spending requirements, the reasons why not and how they plan to meet the spending requirements in the future.	GAO-13-421	Closed-implemented SBA updated its template that agencies use to report program information annually for fiscal year 2013 data, which was submitted in June 2014. The updated template included a place for agencies to include their methodologies for calculating their extramural R&D budgets. Further, SBA updated the annual report template for the agencies' fiscal year 2015 data to request information from agencies that did not meet the spending requirement on the reasons why and measures the agency is taking to meet or exceed the spending requirement in the next fiscal year.

Category and recommendation	Report number	Status
Recommendation to: SBA To improve compliance with the Small Business Act and enhance SBA's ability to provide oversight of the programs, the SBA Administrator should revise the language in the SBIR and STTR policy directives to accurately summarize the statutory provisions that describe the program spending requirements.	GAO-14-431	Open In April 2016, SBA proposed an update to its SBIR and STTR policy directive to state that each participating agency must spend (obligate) the required amounts on the programs, which is consistent with the statutory provisions for program spending requirements. However, according to SBA officials, in January 2017, the policy directive was withdrawn from the Office of Management and Budget and is under further internal consideration in light of a recent executive order. As of April 2017, SBA has not established a time frame for publication of the final policy directive.
Recommendation to: SBA To improve compliance with the Small Business Act and enhance SBA's ability to provide oversight of the programs, the SBA Administrator should provide written guidance to agencies clarifying whether and how agencies should submit data to SBA on spending outside of awards that is allowed under the programs, such as discretionary technical assistance.	GAO-14-431	Closed-implemented In response to our recommendation, SBA revised its templates that participating agencies use to report information to SBA annually to specifically identify obligations for the programs outside of awards, such as discretionary technical assistance and two pilot programs. These templates were used for the fiscal year 2013 data that agencies reported to SBA in June 2014.
Recommendation to: Department of Health and Human Services (HHS) To help ensure that the agency continues to spend the required amount for the STTR program, the Secretary of Health and Human Services should include all of the agency's extramural R&D budget in the calculation of STTR spending requirements and in the data submitted to SBA.	GAO-14-431	Closed-implemented According to program documents and agency officials, HHS included all of its extramural R&D in its budget data for the STTR program beginning with its annual report for fiscal year 2014, which was submitted in March 2015.
Recommendation to: SBA To ensure full compliance with SBIR and STTR spending and reporting requirements, the SBA Administrator should notify Congress in SBA's annual report if it cannot determine agency compliance with program spending requirements when agencies that participate in the SBIR and/or STTR programs do not report extramural R&D obligations data, or develop a proposal to Congress that would change the requirement.	GAO-15-358	Closed-implemented In SBA's annual report to Congress on the SBIR and STTR programs for fiscal year 2013, which was submitted in April 2016, SBA clearly reported whether agencies reported extramural R&D obligations data. The report states that SBA could not accurately determine whether agencies that reported budget figures, rather than obligations, complied with program spending requirements for fiscal year 2013. Further, the report states that SBA will continue to work with agencies to continue to improve reporting.

Category and recommendation	Report number	Status
Recommendation to: SBA To ensure full compliance with SBIR and STTR spending and reporting requirements and improve participation in the administrative pilot program, the SBA Administrator should review SBA guidance regarding when an agency is required to start up an SBIR or STTR program, and if necessary, update the guidance to provide greater clarity to agencies with R&D obligations greater than the thresholds for participating.	GAO-16-492	Open According to SBA officials, as of April 2017, SBA is working to develop language to update its policy directives to provide guidance on when an agency must start an SBIR or STTR program.
Other reporting requirements		
Recommendation to: SBA To ensure that participating agencies and SBA comply with spending and reporting requirements for the SBIR and STTR programs, the SBA Administrator should provide timely annual feedback to each agency following submission of its methodology report on whether its method for calculating the extramural R&D budget used as the basis for the SBIR and STTR spending requirements complies with program requirements including an itemization of and an explanation for all exclusions from the basis for the calculations.	GAO-13-421	Open In April 2017, SBA officials said that SBA provided feedback to all agencies regarding their agency methodology reports. When SBA provides documentation, we will review the information and determine whether it meets the intent of the recommendation.
Recommendation to: SBA To ensure that participating agencies and SBA comply with spending and reporting requirements for the SBIR and STTR programs, the SBA Administrator should provide Congress with a timely annual report that includes a comprehensive analysis of the methodology each agency used for calculating the SBIR and STTR spending requirements, providing a clear basis for SBA's conclusions about whether these calculations meet program requirements.	GAO-13-421	Open According to SBA officials, as of April 2017, SBA had completed a draft of its report to Congress for fiscal year 2014 and expected to send it to the participating agencies and the Office of Management and Budget for review after SBA completed its internal review. The officials said that the report for fiscal year 2015 is being drafted, and SBA is in the process of reviewing the participating agencies' data for fiscal year 2016, which were due to SBA in March 2017. As of April 2017, SBA did not have an anticipated issuance date for the reports to Congress for fiscal years 2014, 2015, or 2016.

Category and recommendation	Report number	Status
Recommendation to: SBA To improve compliance with the Small Business Act and enhance SBA's ability to provide oversight of the programs, the SBA Administrator should request that the agencies submit their methodology reports within 4 months of the enactment of appropriations, as required by the Small Business Act and the program policy directives.	GAO-14-431	Closed-implemented To improve agency compliance with the Small Business Act and enhance SBA's oversight, in February 2016, SBA's Director of Innovation and Technology sent an email reminding the SBIR and STTR program managers to submit their methodology reports within 4 months of receiving appropriations, in accordance with the program policy directives and statute.
Recommendation to: SBA To ensure full compliance with SBIR and STTR spending and reporting requirements, the SBA Administrator should assess the methodology reporting requirement to determine whether it generates adequate information for SBA to analyze the accuracy of agencies' calculations of their extramural R&D. If SBA finds that the information is inadequate, SBA should update its guidance to require adequate information.	GAO-15-358	Open In April 2016, SBA proposed expanded guidance to agencies regarding their annual methodology reports in its update to the program policy directives. The proposed guidance required agencies to include an explanation of the calculation of the total extramural R&D, an itemization of excluded programs, and an explanation of why the program was excluded, as well as a review of the agency's compliance with the funding requirement for the prior fiscal year and a funding plan for the current fiscal year for how the agency plans to meet or exceed the year's expected minimum obligations requirement. However, according to SBA officials, in January 2017, the policy directive was withdrawn from the Office of Management and Budget and is under further internal consideration in light of a recent executive order. As of April 2017, SBA had not established a time frame for publication of the final policy directive.
Recommendation to: SBA To ensure full compliance with SBIR and STTR spending and reporting requirements and improve participation in the administrative pilot program, the SBA Administrator should restore guidance requesting that agencies provide dollar amounts for exclusions in agency methodology reports to SBA.	GAO-16-492	Open According to SBA officials, SBA updated its annual report template to collect the dollar amounts associated with programs exempted and excluded from the calculation of extramural R&D. We will review the updated template when SBA provides it to us.
Administrative pilot program		
Recommendation to: SBA To ensure full compliance with SBIR and STTR spending and reporting requirements, the SBA Administrator should provide greater transparency for the administrative pilot program by requiring participating agencies to provide data on the use of the funds, rather than a total cost for all of the activities under the pilot.	GAO-15-358	Closed-implemented SBA updated the annual report template used to collect program data from the agencies for fiscal year 2014, which was submitted in the spring of 2015, to require agencies to provide detail on how the administrative pilot program funds were used and how the activity relates to the agency's funding plan. Agencies that participated in the administrative pilot provided the requested information to SBA.

Category and recommendation	Report number	Status
Recommendation to: SBA To ensure full compliance with SBIR and STTR spending and reporting requirements and improve participation in the administrative pilot program, the SBA Administrator should complete the required reporting on the administrative pilot program for fiscal year 2014, which could include an evaluation of the potential constraints that may hinder agencies' participation and any steps taken to address these constraints.	GAO-16-492	Open As of April 2017, SBA officials said that SBA is in the process of completing its follow-up with agencies to document their utilization of the administrative pilot program. Specifically, officials said they requested that agencies that planned to participate in the pilot program complete a template with information on the pilot program. Once SBA receives that information, officials said they will draft a report. As of April 2017, a formal date for completing and submitting the report had not been established.
Fraud, waste, and abuse prevention		
Recommendation to: SBA To help improve agencies' implementation of the fraud, waste, and abuse prevention requirements in the policy directives, we recommend that the Administrator of SBA confirm that each SBIR and STTR agency is implementing the minimum fraud, waste, and abuse prevention requirements in the policy directives, by, for example, requesting documentation from agencies.	GAO-17-337	Open SBA agreed with our recommendation. In comments on our draft report, SBA officials said that SBA will request that each participating agency confirm its implementation of the minimum fraud, waste, and abuse prevention requirements. We will review SBA's actions when they are complete.
Recommendation to: SBA To help improve agencies' implementation of the fraud, waste, and abuse prevention requirements in the policy directives, we recommend that the Administrator of SBA request input from the participating agencies regarding the clarity of the requirements; review all of the SBIR and STTR minimum fraud, waste, and abuse prevention requirements, including the agency requirement to post information about successful SBIR or STTR fraud prosecutions; determine whether any additional guidance is needed; and revise the policy directives accordingly.	GAO-17-337	Open SBA agreed with our recommendation. In comments on our draft report, SBA officials said that SBA will contact all agencies to inquire if additional clarity is needed regarding any of the fraud, waste, and abuse prevention requirements and, if necessary, provide additional guidance. We will review SBA's actions when they are complete.

Category and recommendation	Report number	Status
Recommendation to: SBA To help improve agencies' implementation of the fraud, waste, and abuse prevention requirements in the policy directives, we recommend that the Administrator of SBA revise the fraud, waste, and abuse provisions in the policy directives to reflect the definition of essentially equivalent work used elsewhere in the policy directives and require participating agencies to check for essentially equivalent work that they fund as well as such work funded by other agencies.	GAO-17-337	Open SBA agreed with our recommendation. In comments on our draft report, SBA officials said that SBA will take steps to revise the SBIR and STTR policy directives to reflect the definition of essentially equivalent work as noted in section 3 of the policy directives and will work with all parties to determine how to best address the issue of duplication. We will review SBA's actions when they are complete.
Recommendation to: SBA To help improve agencies' implementation of the fraud, waste, and abuse prevention requirements in the policy directives, we recommend that the Administrator of SBA evaluate SBIR and STTR agencies' fraud, waste, and abuse outcomes to ensure the fraud, waste, and abuse prevention requirements are appropriate and meet their intended purpose for the SBIR and STTR programs.	GAO-17-337	Open SBA agreed with our recommendation. In comments on our draft report, SBA officials said that SBA will survey the participating agencies regarding whether the requirements are necessary and meeting their intended purposes; are placing undue burdens on the agencies; or need to be revised, updated, or eliminated. We will review SBA's actions when they are complete.
Recommendation to: HHS To help improve the implementation of the fraud, waste, and abuse prevention requirements, we recommend that the Secretary of HHS direct the HHS SBIR and STTR program offices to collect copies of the self-certification forms from its SBIR and STTR awardees.	GAO-17-337	Open HHS disagreed with our recommendation and raised three issues explaining why it did not concur with our recommendation. First, HHS stated that it has implemented the requirements in the policy directives for life cycle certifications. Second, HHS stated that the agency cannot accurately determine when certifications are due to collect them because its financial data is typically 45 days in arrears. Third, HHS stated that grant fraud cases, including those for the SBIR or STTR programs, have been successfully prosecuted without grantees proactively submitting life cycle certifications .We continue to believe that taking steps to collect the certifications from SBIR and STTR awardees would bring HHS into full compliance with this requirement, and would provide HHS with better assurance that the awardees understand and agree to the terms of the contract. We therefore continue to believe that it is important for HHS to collect the signed life cycle certification forms from small businesses, and we retained the recommendation.

Category and recommendation	Report number	Status
Recommendation to: Department of Defense (DOD) To help ensure that DOD is implementing the fraud, waste, and abuse prevention requirements to the OIGs, we recommend that the Inspectors General of the Army, Navy, and Air Force implement the requirements themselves or delegate the implementation of the requirements to the investigative services.	GAO-17-337	Open DOD agreed with our recommendation. We will review DOD's actions when they are complete.

Source: GAO | GAO-17-594T

Related GAO Products

Small Business Research Programs: Additional Actions Needed to Implement Fraud, Waste, and Abuse Prevention Requirements. GAO-17-337. Washington, D.C.: April 25, 2017.

Small Business Research Programs: Agencies Have Improved Compliance with Spending and Reporting Requirements, but Challenges Remain. GAO-16-492. Washington, D.C.: May 26, 2016.

Small Business Research Programs: Challenges Remain in Meeting Spending and Reporting Requirements. GAO-15-358. Washington, D.C.: April 15, 2015.

Small Business Innovation Research: Change in Program Eligibility Has Had Little Impact. GAO-15-68. Washington, D.C.: November 20, 2014.

Small Business Research Programs: More Guidance and Oversight Needed to Comply with Spending and Reporting Requirements. GAO-14-431. Washington, D.C.: June 6, 2014.

Small Business Research Programs: Agencies Did Not Consistently Comply with Spending and Reporting Requirements. GAO-14-567T. Washington, D.C.: April 24, 2014.

Small Business Research Programs: Actions Needed to Improve Compliance with Spending and Reporting Requirements. GAO-13-421. Washington, D.C.: September 9, 2013.

Small Business Research Programs: Agencies Are Implementing New Fraud, Waste, and Abuse Requirements. GAO-13-70R. Washington, D.C.: November 15, 2012.

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TESTIMONY OF JOHN CLANTON, CEO
LYNNTECH, INC.

BEFORE A JOINT HEARING OF THE SUBCOMMITTEE
ON CONTRACTING AND WORKFORCE,
SMALL BUSINESS COMMITTEE
US HOUSE OF REPRESENTATIVES

AND

THE SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY,
SCIENCE, SPACE AND TECHNOLOGY COMMITTEE
US HOUSE OF REPRESENTATIVES

Washington, DC

May 4, 2017

Lynntech, Inc. | 2501 Earl Rudder Frwy South College Station, TX 77845 | P 979.764.2200

Lynntech

Chairman Knight, Ranking Member Murphy, Chairwoman Comstock and Ranking Member Lipinski, Members of the Subcommittee: On behalf of Lynntech, Inc. I would like to thank you for the opportunity to appear before you today to offer our company's insights on additional improvements to the Small Business Innovation Research Fund (SBIR). These suggested improvements would enhance the effectiveness of the Program in generating technological innovation in the commercial and military marketplaces.

Since our founding in 1987, Lynntech has a proud history of performance within the SBIR program. Not only have we won a significant number of contracts, but we have also generated transition of these technologies particularly in the fuel cell, fuel cell testing, and military technology markets. Today, we have significant efforts ongoing in three areas: (1) infrared camera signal improvements, (2) power systems for the Navy's Unmanned Undersea Vehicle programs and (3) on demand hypoxia training devices that do not rely on gas bottles for support thereby easing the logistics burden and costs of the preceding programs. This latter effort is crucial because Lynntech will be entering production of these devices in the 2nd Quarter of 2018. Representative Murphy will be pleased to hear that we unveiled the technology at last year's I/TSEC event in Orlando, the world's preeminent military training and simulation showcase. In two weeks we travel to NATO to present the technology. Thus, there is a strong likelihood that we will have achieved that rare event in the SBIR program; an export orderbook. The result of these activities led to the SBA acknowledging Lynntech as a 2016 recipient of the Tibbetts award.

As you can see, Lynntech has been focused on transition for some time and we have been active participants and observers of the manner in which the agencies have helped SBIR awardees to gain a foothold in a procurement market that follows on from their SBIR work. We also applaud efforts in the past to make the SBIR program more flexible and to allow agencies to piggyback investments already made in order to bring a technology to market as fast as possible.

However, the focus on commercialization across agencies has not always been consistent. There are several reasons for this. Since most of the work that Lynntech has done is in the military sector, I will focus my attention there:

1. Despite the persistent support from political appointees, the procurement system discourages program managers from taking risk. Thus, new technology development has a high barrier to entry.
2. The Planning and Budgeting process at DOD is inflexible when new technology developments are proposed and of interest to the acquisition

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manager. Funding is locked in years in advance. Everything in the system militates against the insertion of new technologies.

3. The Services approach to the SBIR program differ widely. The Navy has an active program of SBIR utilization, although even here it is difficult to get new technologies certified for use in the fleet. Since my last appearance before the Small Business Committee three years ago, the Air Force has made great strides toward commercialization success under the new leadership at the SBIR Program Manager's office. And although Lynntech has been critical of the Army's transition success rate, I can report that at recent events, including the TARDEC Industry Days, that SBIR research is being incorporated into new technology developments for the future infantry vehicle fleet. This is real progress.
4. The reason that many successful technology development firms don't participate in the SBIR program is the fact that it can take years before your new technology can be transitioned. These delays are not only the result of risk-averse program management but also due to a contracting process that can be termed as glacial. It is not uncommon for Lynntech to be notified of a contract selection to not see the award for anywhere from 6-12 months after notification. Small businesses have a difficult time coping with such delays.

Authorization Legislation

Lynntech was gratified to see that the SBIR program was re-authorized last year but disappointed that many of the improvements that many of us were looking for were not adopted. We are hopeful that these improvements can make their way into a new bill going forward with the joint support of both the Science and Small Business committees. I will summarize our recommendations for minor changes to the program which we will provide greater opportunity for commercialization.

1. Recommendations for the Congress Regarding SBIR Improvement

The Small Business Innovation Research Program is an important tool for the US Government to support innovative research performed by 11 Federal agencies. The largest programs are administered by the Department of Defense and the National Institutes of Health.

The program is currently authorized to operate through 2022. However, several pilot initiatives are set to expire at the end of FY 2017. The two pilots of most

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importance to Lynntech is the ending of the Direct to Phase II and the elimination of the 3% administrative pool.

Lynntech has been the beneficiary of a Direct to Phase II award and is on a path to commercialize an important technology for the Defense Health Agency. The Direct to Phase II means that prior development work undertaken by Lynntech can be applied immediately to further a technology that can be used to address a capability gap and to get that technology to the warfighter that much more rapidly.

The 3% administrative pool should also be reauthorized as this was a good vehicle to help educate acquisition managers on how they can transition SBIR technologies to their platform and how to help underwrite Phase III initiatives. We believe that the 3% pool should be made permanent and to deliver Congressional intent as to utilizing the pool for commercialization support.

Our other recommendations:

1. Expand the financial resource pool by eliminating the word "extramural" from the resource pool definition.
2. Clarify Congressional intent by making it clear that subsequent Phase II awards are an acceptable exception to the acquisition rules regarding competitive awards since the competitive pool was created by the Phase I process. The current statutory language and the SBA Policy Directive is unclear on this point, which is to ensure that a promising technology receives the support it needs to be fully developed. Furthermore, some agencies have interpreted the acquisition language in such a way that it stifles discussion between the contractor and the program managers to ensure that the technology development fully meets the requirements of the acquisition program. The competition took place at the Phase I level and subsequent contract developments should be negotiated between the contractor and the Government.
3. Allow Federal agencies to award up to a cap of $3 million on Phase II awards.
4. Allow Federal Agencies to make multiple Phase II awards sufficient for transition.
5. Allow for Cross-agency Phase II awards in circumstances where a small business concern has received a Phase I, Phase II or subsequent Phase II awards from another agency. This needs to be fully defined in the SBA Policy Directive.

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2. A comment on University attitudes to the SBIR program

Last year, the Universities were highly critical of the discussion surrounding the improvement of the SBIR program that was being discussed. In their testimony before the Science Committee, the Universities noted that any consideration of a set-aside increase of the SBIR would harm the ongoing availability of Federal fiscal resources for the University-based research. It should be noted that their statements in regard to the growth of the set-aside in previous years ignored the base dollars that flowed to the SBIR program which was miniscule in relation to the total Federal R&D funds available to the Universities.

Lynntech has had a close relationship with its University partners, including Texas A&M among many others. Currently, our partners benefit from our receipt of SBIR funding support as we award nearly 20% of our contract revenue in the form of subcontracts to our partners. Their position ignores the importance of the small business community serving as a vehicle to transition technologies out of the lab and into the marketplace.

A recent Forbes magazine article that Universities as a whole (and there are exceptions) have not utilized corporate relationships to move from basic research to engineering development. It is engineering development that fuels economic activity and it is the engineering development component of the SBIR program that our University partners will fully realize the promise of new technologies coming out of the lab.

I appreciate this opportunity to offer Lynntech's observations on the current state of the SBIR program and the potential for offering improvements to enhance the commercialization of SBIR funded development. I stand ready to answer any questions you may have.

Thank you.

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Testimony of Dr. John S. Langford,
Chairman & CEO, Aurora Flight Sciences Corporation
President-Elect, American Institute of Aeronautics & Astronautics (AIAA)

Chairman Knight, Chairman Comstock, members of the committee, thank you for the opportunity to share my thoughts on the SBIR program today. I would like to make two general points today: the first is on my direct, personal experience with the SBIR Program, and the second is on the contributions of the SBIR Program to broader issues of America's international competitiveness and innovation.

In the spring of 1989 I had completed my doctorate in aeronautics and public policy at MIT. I had spent some time as an engineer at the Lockheed Skunk Works, and I had just completed a human-powered aircraft program called Daedalus that set world distance and duration records when a Greek Olympic cyclist pedalled the aircraft my team had built on a flight from Crete to Santorini. I was interested in starting a company to commercialize this technology, but I had no practical understanding of how to do so. I took two short courses: one in Entrepreneurship from the University of Maryland, and one on the SBIR Program, taught by Harry Johnson of NASA.

I founded Aurora Flight Sciences Corporation in late May of 1989, and that fall we won our first two contracts: an SBIR from NASA on fuel cells for electric aircraft propulsion, and another SBIR from NSF, on the atmospheric science applications of such an aircraft.

Since that time, Aurora has grown and prospered. To date we have earned revenues of approximately $1.2B billion. We are no longer eligible for the SBIR/STTR program, but over the more than two decades that we were, we won slightly over 200 SBIR and STTR contracts worth approximately $59 million. This was about 5% of our total revenue during this period, a relatively small amount, but I want to stress that it was a critical 5% as it provided the seed for innovation for essentially all of our modern programs. The core fan technology for our revolutionary hybrid-electric XV-24A Lightningstrike vertical takeoff aircraft, for example, came out of a DARPA SBIR. Our Orion ultra-long endurance UAS, which holds the current world record for UAV endurance, evolved out of those original NASA and NSF SBIRs. I could go on and on.

In our early days, the SBIR program provided the first customer funding that allowed us to start our business. While we also took in private venture capital, the SBIR program allowed us to keep control of the business, which has been a key to our longevity. It introduced us to the complexities of government contracting, allowing us to grow into a significant competitor to the larger, better established players – and competition is truly the surest way to reduce costs and improve procurement efficiency. Once we were established, the SBIR program allowed us to train new engineers in the art of program management, and it provided opportunities for anyone in our company to experiment with new ideas. "You get to eat what you kill" we told our engineers – if you write an SBIR proposal and you

win, you get to run it. This provided an incredible diversity of new ideas which spurred innovation.

Friends and colleagues from around the world are constantly amazed to learn about the SBIR program. They ask incredulously: "The U.S. government will give you money to start a business?". I have met no comparable program in any of my travels – and as a result, the U.S. continues to be a beacon and a magnet to the most talented people from around the world.

We are constantly bombarded with stories of public programs that fail, or have been misdirected, or that somehow disappoint. The SBIR program is an example of a government program that works, and it works spectacularly. I and the employees of Aurora Flight Sciences in Virginia, West Virginia, Mississippi and Massachusetts offer an example of what the SBIR program can contribute to America's economic growth, and help us compete effectively in the international arena. When I am given the opportunity to share one thought with any elected official, I always try to make the point: SBIR is a government program that is a massive success. It deserves your continued support.

Thank you for the opportunity to testify today. I look forward to any questions you may have.

Ronald D. Shroder

Congressional Testimony

May 4, 2017

House of Representatives Small Business Subcommittee

Improving the SBIR and STTR Programs

- Chairman Knight, Chairwoman Comstock, Ranking Member Murphy, Ranking Member Lipinski, and members of the Subcommittee on Contracting and the Workforce of the Committee on Small Business and the Subcommittee on Research and Technology of the Committee on Science, Space and Technology, Thank you for the invitation to speak to you today. It is an honor to participate in your hearing on such an important topic as the SBIR and STTR Programs and ideas on how to improve them.
    - Before I begin, I believe it is critical to appreciate how incredibly important it is for our country to be world leaders in a strong R&D culture and how much the SBIR and STTR Programs have been such an important piece of that culture.
        - The 2014 AF SBIR Impact Study is just one source that shows what I believe to be metrics of one of the most successful Small Business Programs the United States has ever implemented.
        - The initial analysis that has been released from a Navy Study seems to amplify similar and in some cases even more aggressively positive results.
        - The entire community owes a debt of gratitude to those originators of the program, like Rolland Tibbetts, Jere Glover and so many others more than 35 years ago, who had what I believe to be a brilliant idea, and converted that into a legacy that will never be forgotten.
            - At times I think of that group as entrepreneurs that created a "Shark Tank-like" concept 35 years ago.
            - I am in awe of that group since many of us may be aware of major corporations that have roots back to the SBIR Program – companies that I consider the "Rock Stars" of the SBIR Culture. It is my understanding that Amgen, Qualcom, Symantec, and IRobot are just a few of the amazing success stories. FTI and many other SBIR awardees would like to join that list.
        - In addition, I believe Congress also has been equally important to the program's success. Over the years, you and your predecessors have reauthorized the law and made changes to the program that have had a very substantial impact. Some of those would include:
            - The thrust to reduce the time between Phase I and Phase IIs awards,
            - "The allowance of the small administration fees for the organizations that facilitate the Government actions needed for implementing the program and making awards,"
            - The approval of the Phase IIB and RIF Programs,

- Your strengthening a SBIR firm's data and Intellectual Property rights,
- Your requiring agencies to award follow on Phase III contracts to SBIR firms if appropriate, and
- Your insight to allow successful SBIR related Small Businesses to be supported by Phase III rules, even after they have out grown the Small Business size standards.

- However, as you seek to find even more improvements for the Program, I believe it is important to make sure that we go back to:
  - What I believe to be the basic intents of the program -
    - Stimulation of technological advancement,
    - Small Business involvement in Federal R&D,
    - Participation by socially and economically disadvantaged businesses, and
    - Commercialization of technologies that lead to economic growth.
  - There is a great deal to be proud of in each one of these areas.
  - There will always be adjustments that could be made to do additional improvements in each one of these areas (some of which may or have been mentioned by the other testimonies given today).
- If you would allow me, I would like to focus primarily on the area of Commercialization.
  - I am personally passionate about the Commercialization area because that is where dramatic economic growth and jobs come from, and that is also where FTI successes have come from.
  - FTI is a company that is blessed to have been founded by an incredibly powerful entrepreneur, Lavon Jordan, whose core values, ethics, and personality convinced talented researchers to not only accept our offer of employment, but to potentially become co-owners of the company, and our commitment to them always has needed to include long term continued jobs.
  - FTI also requested that our researchers stay very focused on technologies that assist the Federal Government to make informed decisions based on the staggering amounts of data that are typically available. We felt that not only does this address a real need, but as a company we could become distracted if we pursued all the technologies that might be of interest to our researchers.
  - FTI was also in locations like Southern California, Southwestern Ohio, Virginia and Northern Alabama where there are some of the best national resources focused on DoD R&D and acquisition of technology.
  - FTI found that when you combine our researchers with those DoD organizations, true entrepreneurial thoughts and solutions blossom.
  - Phase Is, Phase IIs, CPPs, & RIFs are all wonderful pieces of the program, however it quickly became very clear that Phase I and II SBIR funding supports a small number of jobs over a relatively brief time period.
    - It is very similar to Shark Tank; the Shark Tank or SBIR Phase I and II funding is important, but it really cannot or should not be the end point.
  - Commercialization (especially Phase IIIs) can be the key to the ultimate success of the program, and I believe this aligns with the Congressional Intent of the program.

- Commercialization – Phase IIIs – certainly is what caused FTI to change from a small business mindset to having dramatic growth in employees and revenue, as well as our being recognized as a Tibbetts Awardee.
- Just one Phase III IDIQ contract can provide a company with a stronger foundation of longer term technological use, economic growth, jobs, and security.
- Again, Congress deserves a great deal of appreciation for everything that they have put in place that makes the Phase III awards possible.

- However, being out in the environment trying to implement what I believe to be your vision, I will say it might be tougher than you expect or intended.
  - Many individuals in the Federal workforce have touched SBIR/STTRs especially in the Phase I or Phase II area.
  - Yet, we find many do not realize that for Commercialization Phase III awards, there are numerous aspects that are nearly opposite of what they learned by working with the Phase I or Phase II Program:
    - Competitive vs. Sole Source,
    - R&D Funds vs. any kind of funds,
    - Limited funding levels vs. unlimited funding levels,
    - Small Business Size Standards vs. the Standards no longer apply,
    - And more.
  - We have found that before the Federal Contracting community agrees to put a Phase III contract in place, they typically must ramp up their knowledge of SBIR, especially Phase III law.
    - Efforts like the Navy and Air Force Phase III Guidebooks have been extremely helpful in educating the community.
      - The Navy has trained Contracting Officers (COs) how to contract Phase III and provided sample contracts to make issuing a new one an easier effort.
    - Without the training or approved examples for COs, there are additional delays that can dramatically impact job growth, just like delays in getting Phase II awards after the Phase I is completed.
  - It is my belief that any one of the following ideas could have a significant impact if each major SBIR organization were to:
    - Have a separate office focused specifically on Phase IIIs.
      - That office could educate their Agency's executives as to the power of the Phase III to generate substantial benefits to the Agency.
      - Each Phase III office could include an Ombudsman that could assist the Small Businesses and their potential customers to generate actual awards.
      - The office could include COs who
        - Are empowered to award Phase III contracts, and
        - Have established templates for Phase III contracts that would facilitate both thoroughness and yet quickness in contracting.
      - Use part of the Administrative Funding to:

- Increase participation by women and minority owned businesses and businesses in underserved states and areas,
- Create the Phase III Ombudsman for each Agency,
- Create standardize, simplified Phase III procedures and contracts.

- In addition, I have seen how the reporting pressures make a difference in how supportive organizations are to facilitating Phase III awards.
  - So full implementation of the established laws for reporting of Phase III awards by agencies and by major prime contractors could have a significant impact on job creation, and
- So please consider ways to emphasize a complete implementation of the current reporting requirements of existing law.

- In summary, FTI has been blessed to be a part of this tremendous SBIR/STTR Program. While FTI is just one data point in your list of SBIR companies, our data point demonstrates that real growth and job creation comes with the commercialization success. I think of it this way: Phase I and Phase II awards are the equivalent of being handed an opportunity to commercialize, but you need to keep your eye on the prize. FTI has received approximately 6 Phase III awards over the last several years, and they have been incredibly valuable, empowering us to support our existing and potential customers who seek our products and services that derive from, extends or logically concludes our technology suite. However, in almost every case there were significant delays, predominantly in educating the community (Contracting Officers and Program Managers) as to what your SBIR Law allows for Phase IIIs. For those companies that follow FTI into the Phase III area, I believe that with some minor adjustments to the Program, along with some of the issues I have addressed and that we can continue to discuss today, this Program may be able to facilitate even more success, job creation, economic impact, and many other of the SBIR desired results.

Again, Thank You for your time today and for your focus on trying make the program better.

Attachments and Informational References / Links

- Attachments and links to referenced documents
  - SBTC 2017 White Paper attached
    - http://sbtc.org/wp-content/uploads/2017/01/SBTC-SBIR-White-Paper-2017.pdf
    - Also attached
  - Link to AF Economic Impact Study
    - https://www.sbir.gov/sites/default/files/USAF%20SBIR-STTR%20Economic%20Impact%20Study%20FY2015.pdf
  - Link to Navy Economic Impact Study
    - http://www.secnav.navy.mil/smallbusiness/Documents/DON-SBIR_STTR_Guidebook_V1_2-Apr-16.pdf
  - Link to Navy Phase III Guidebook v. 1.2
    - http://www.secnav.navy.mil/smallbusiness/Documents/DON-SBIR_STTR_Guidebook_V1_2-Apr-16.pdf
  - Link to Air Force Guidebook
    - http://www.wpafb.af.mil/Portals/60/documents/afrl/sbir/PhaseIII_Booklet-APR2017-FINAL-WEB.pdf?ver=2017-04-07-124631-293

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Small Business Innovation Research (SBIR): Leveraging American Business Growth and Jobs

SBIR: Entrepreneur-Driven R&D to Support American Economic Revitalization

A White Paper

January 19, 2017

SBTC
Small Business Technology Council

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Executive Summary:
SBIR Offers a Lever for Economic Revitalization

Congress and President Reagan created the Small Business Innovation Research (SBIR) program in 1982 to mobilize small business entrepreneurship and innovation to bridge a technology gap eroding American competitiveness and jobs. SBIR solely funds R&D meeting agency objectives, but the follow-on economics are dramatic: SBIR leverages America's entrepreneurs and small business technical skill to innovate solutions to important American challenges while creating new products and jobs transforming American industry. Today, facing uneven economic growth and aging infrastructure, we can strengthen SBIR/STTR1 investment, unleashing small business energy and jobs in a new wave of 21st century American-made products and services.

Despite <1.7% of overall Federal R&D funding, SBIR/STTR is a primary driver of American economic strength. SBIR R&D projects are our technology seed corn. High quality R&D met Federal needs while seeding new startups and driving the growth of small businesses with their new technology products and services. Global giants such as Qualcomm, Symantic, Biogen, iRobot, Genzyme, Illumina, and Genentech emerged from SBIR funding. Meanwhile, SBIR businesses and technologies were also sold or licensed, energizing older industries while cutting costs and generating entire new divisions and new jobs located here in America. Follow-on new product investment and sales have totaled hundreds of billions of dollars.

SBIR firms produced life-changing breakthroughs in defense, energy, communications, information and bioscience - new tech building blocks for American manufacturing. Agency mission objectives were accomplished. DOD strengthened capabilities while cutting costs. The Air Force saved over $500M on the F-35 aircraft. A Navy project saved over $1M per hull on the Virginia Class submarine. University/small business collaborations converted basic science into products and services, with 30-60% of SBIR technologies involving current or former faculty. With less than 1.7% percent of Federal R&D, SBIR/STTR firms have created over 20 percent of America's major innovations, and as many patents as all universities combined.

America's basic science is a primary national strength, but converting that science to American innovations and jobs faces increasing international competition. **The SBIR/STTR program funds the seed corn for this challenge, combining private enterprise with American ingenuity to enable new innovations while building new products and businesses.** SBIR asks our nation's small businesses, employing 38% of our scientists and engineers and led by American entrepreneurs, to convert American science into new scientific breakthroughs and useful innovations for commercial use, and to use that tech to build their businesses. SBIR firms must be American-based and owned small businesses, with all work done in the U.S. The new technology, products and services advance agency missions, meet market and societal needs, and create new sustainable high quality, high paying manufacturing and service jobs while raising living standards.

The data supports this impact, and suggests doing more can increase the success. 17 National Academy of Sciences studies concluded SBIR met its goals and showed SBIR/STTR Phase II awards commercializing at rates from 45-70 percent, a remarkably high result. Recent economic impact studies by the Air Force and Navy SBIR/STTR programs detail job and wealth creation with broad regional benefits, plus provide data on taxes and revenue paybacks. The SBIR/STTR program clearly provides a

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[1] Congress passed and George H. W. Bush signed Public Law No: 102-564, which created a smaller, companion Small Business Technology Transfer (STTR) program in 1992, for academic partnering.

big bang for the federal R&D dollar.

- Both Air Force and Navy found high SBIR returns, e.g. the Navy found every dollar invested in the Navy SBIR/STTR programs led to over $6 of new product sales and over $19 of total American economic output just within a 14 year period. Tax income in the period more than repaid the SBIR R&D funding. Job quality was high, with average income of $68,535.
- The studies did not capture the large sales and economic effects from technologies sold or licensed. Over 13% of the Air Force small businesses had been acquired for their SBIR technology by larger firms and an additional 10% of the technologies were licensed to other firms, energizing the defense contractors that acquired or licensed the technologies and creating the base for new business divisions.
- Federal tax calculations show the SBIR/STTR program more than repays the government investment: $1.46 in increased Federal taxes for every dollar spent on SBIR. State and local taxes add another 71¢, for a total return of 217%, just in taxes.

SBIR/STTR outreach to underserved states and groups is broadening the impact and strengthening national STEM results. SBIR/STTR is leveraging the nation's dramatic spread of "innovation hubs" in geographically disenfranchised regions, led by regional industry/academic/ government partnerships, and redefining STEM. New products meeting important American STEM challenges are energizing new generations looking for meaning in work. Increased heartland investment in SBIR/STTR, with technology mining by large firms committed to public infrastructure revitalization, can become a keystone of the Rustbelt's manufacturing revival.

Long-deferred American public infrastructure revitalization offers the same opportunity for improved performance via SBIR/STTR innovation and new STEM architectures that has transformed the defense, energy, bioscience, communication, and information industries. SBIR/STTR infusion offers the potential for simultaneous performance improvements and dramatic cost reductions throughout our economy as we reinvigorate our infrastructure.

As we consider how to sustainably grow America's economy with new products and jobs capable of fully engaging and employing America's workforce with high quality jobs, **SBIR/STTR offers a highly-efficient proven innovation lever for American economic revitalization that creates new technology and jobs within existing R&D budgets.** With 35 years of Congressional support for small business innovation as an unmatched economic growth engine, small firms already generate over 20% percent of America's top technologies and ~40% of tech employment.

We should build on programs that work in creating economic strength, and make them stronger. The new Administration and the 115th Congress have an opportunity to improve the impact of American skill and entrepreneurship building on America's scientific strength, with the SBIR/STTR program as the fulcrum for creating new innovations and better jobs.

Recommendations:

1. Grow the SBIR/STTR allocation to create more new technology, businesses and jobs.
2. Continue to grow America's long term investment in R&D to support our high value economy.
3. Ensure agencies follow SBIR/STTR policies, including for Phase III support.
4. Reduce paperwork/administrative burden relating to proposals, contract admins and accounting.
5. Focus DOD's Rapid Innovation Fund to SBIR. Develop similar programs at other agencies.
6. Maintain strong intellectual property protections for these new technologies and businesses.

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DISCUSSION

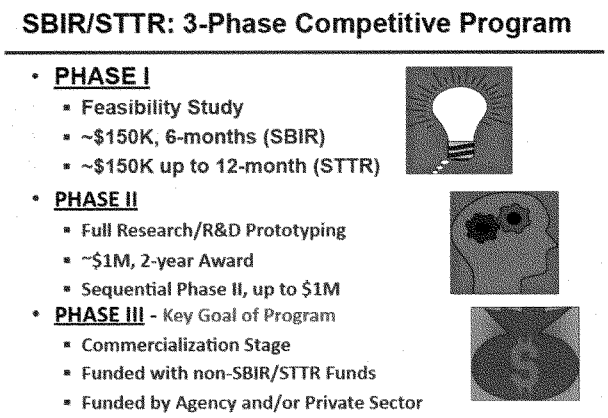
1. SBIR/STTR: Innovation-focused R&D for New Products, Services and High-Quality Jobs

With repeated favorable, detailed assessments by the National Research Council, Government Accountability Office, and Office of Management and Budget since the 1990's, the SBIR/STTR Program has emerged as a very productive component of Federal R&D, delivering high-quality science and engineering solutions for American use. SBIR/STTR innovations convert basic science into products and services to transform the American economy, and create new high-quality jobs.

Through early SBIR/STTR work and its commercialization focus, thousands of firms have started and prospered while not a few garage R&D startups (Qualcomm, iRobot, etc.) have become global tech giants. Many other SBIR technologies have been licensed or sold to other American businesses, re-energizing older industries while cutting costs and generating countless new 21st century jobs.

Planned by Congress to ensure American R&D competitiveness, the program has a simple three-phase structure (Figure 1), with competition as its keystone: just one in eight Phase I proposals is awarded, and only one in 20 go on to Phase II. Annually, about 30 percent of awardees are new to SBIR/STTR.

Figure 1 – Source: Dept. of the Navy SBIR/STTR Program



Phases I and II are funded within large agency R&D budgets, targeted to meeting agency mission objectives, in a disciplined, highly competitive structure. Phase III describes follow-on activity outside of SBIR funding, wherein the newly created innovations enter the economy either through commercial sales or follow-on R&D. The Phase I/II SBIR R&D dollars are leveraged by the follow-on R&D and sales, as well internal investment and energy from the small business. Around 14 percent of all SBIR firms have eventually received venture capital and one of every eight dollars invested by VCs is to an SBIR/STTR involved firm. Many large companies have acquired smaller growing firms driven by SBIR technology, for both the products and the technology, transforming themselves with the infusion of the new technology.

Now, a new wave of SBIR/STTR studies[2] is documenting profound economic impact measured by job creation, high wages, tax revenues, and innovation networks throughout regional economies with resident SBIR/STTR entrepreneurs. From 2000-2013, for example, the Naval SBIR/STTR Program invested $2.3B in Phase II awards estimated to create $44B in economic activity over the period while generating $3.35B in federal taxes – effectively paying for the investment, not counting the longer term effect on jobs and quality of life. As America struggles to level the playing field of economic inequality, SBIR/STTR provides promise and direction, innovating new solutions and combining these with entrepreneurial energy to build new businesses and jobs to replace those lost to industrial obsolescence and foreign competition.

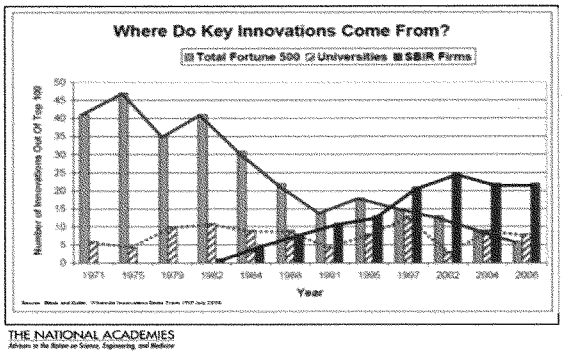
From this Navy study, we see that every dollar invested in SBIR creates $1.46 in Federal taxes, a 46% return. Thus, we have a program which creates tax dollars, not spends them. Further, the SBIR program generates another 71 cents in state and local taxes for every dollar invested in SBIR.

1.1 Program Objective Achievements

Congress learned in a January, 2016 hearing on SBIR[3] that when Arthur Obermayer, one of the founders of the SBIR program, was inducted into SBIR Hall of Fame at the White House, he stated that next to the GI Bill after WWII, SBIR was one of the most significant pieces of legislation ever passed by Congress. Information provided to the Senate Small Business Committee included two vital facts:

a. The SBIR/STTR Program has been copied by 17 nations around the world.
b. With less than 1.7 percent of the Federal R&D budget, SBIR/STTR has created 22 percent of America's key innovations (Figure 2).

Figure 2 – SBIR Role in American Innovation



Source: Fred Block and Matthew R. Keller, "Where Do Innovations Come From? Transformations in the U.S. National Innovation System, 1970-2006", THE INFORMATION TECHNOLOGY & INNOVATION FOUNDATION, July 2008, pg. 15

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[2] TechLink center at Montana State University-Bozeman, in collaboration with the Bureau Research Division of the University of Colorado-Boulder, completed studies of the Air Force SBIR/STTR Program (2015) and the Naval SBIR/STTR Program (2016). TechLink engaged with the Dept. of Defense Office of Small Business Programs in 2016 to study economic impact of other DOD entities.

[3] Jere Glover Testimony " Reauthorization of the SBIR/STTR Programs – The Importance of Small Business Innovation to National and Economic Security " before the Committee on Small Business and Entrepreneurship, U.S. Senate; January 28, 2016, http://www.sbc.senate.gov/public/?a=Files.Serve&File_id=57625744-A72A-424D-8B0B-90E3385108EF.

Committee members also learned that the National Academy of Sciences and its National Research Council's (NRC) 17 reports on SBIR/STTR found that the program meets principal Congressional objectives for SBIR/STTR: (1) to stimulate technological innovation, (2) use small businesses to meet federal R&D needs, and (3) increase the private sector commercialization of innovations derived from federal R&D.

SBIR Over-Achievers: From the Garage to the Globe

Recognizing that Congress seeks tangible evidence of SBIR success, Jere Glover, Executive Director of the Small Business Technology Council, part of the National Small Business Association, produced a signature sample of firms, "... making this the most successful innovation commercialization program in America. Successful alumni of the SBIR program are firms like: **Qualcomm** (cell phone communications), **Symantec** (computer security), **Genzyme** (biotech therapies), **Affymatix** (GeneChip), **Amgen** (biopharmaceuticals), **Jarvick Heart** (artificial heart), **Titan Corp** (information and communications), **Chiron** (pediatric vaccines), **ATMI** (semi-conductor materials and environmental system) (**AMTI** (advanced materials, radars), **Amorworks** (military armor), **Biogen** (Idec, neurological, autoimmune therapies), **American Biophysics** (mosquito control), **Millennium Pharma** (gene databases), **Geron** (telomerase inhibitors for cancer treatment), **Neocrine Bioscience** (neurological and endocrine pharmaceuticals), **ABIOMED** (world's smallest heart pump), **Aerovironment** (unmanned aircraft), **A123 Systems** (lithium-ion batteries), **FuelCell Energy** (fuel cells), **iRobot** (unmanned robotic vehicles and domestic robots), **JDS Uniphase** (fiber optics, lasers, software), **Stem Cells Inc.** (cell based therapies for CNS and liver disorders), **Intra Lasek** (optical surgery), **Illumina** (genomics) and **Nanosys** (quantum dot displays)."

With global graduates in a pool of more than 700 publicly-traded big firms, the SBIR/STTR program is a formidable jobs engine – especially as firms leave SBIR/STTR incubation, or join 1,975 others in being acquired by larger firms, according to the Innovation Development Institute of Swampscott, MA.

National Academy of Sciences: Repeated Stamps of SBIR Approval

While the Government Accountability Office and Office of the Inspector General have scrutinized and reported on SBIR/STTR Program mechanics more than 25 times since 2000, NRC made a definitive SBIR assessment in a series of reports from 2004 to 2009, comprising thousands of pages, on the SBIR programs at the Department of Defense (DoD), National Institutes of Health (NIH), National Aeronautics and Space Administration (NASA), Department of Energy (DoE), and National Science Foundation (NSF)—the five agencies responsible for 96 percent of SBIR operations.

"**The core finding of the study**," NRC wrote, "**is that the SBIR program is sound in concept and effective in practice.**"[4] NRC grouped SBIR program results across federal agencies into four categories, with 380 pages of supporting data:

- Stimulating Technological Innovation
- Increasing Private Sector Commercialization of Innovations
- Using Small Business to Meet Federal Research and Development Needs
- Fostering Participation by Minority and Disadvantaged Persons in Technological Innovation

[4] *An Assessment of the SBIR Program;* National Research Council; April, 2008; pp. 3-7

In repeated appearances before Congressional committees of the House and Senate discussing SBIR reauthorization between 2004 - 2011, NRC science and technology studies director Dr. Charles Wessner advocated strongly for SBIR/STTR expansion and administrative strengthening, especially to enable more outreach to economically disadvantaged areas such as America's Rust Belt, and to women entrepreneurs.

National Academy of Sciences: STTR Partners with SBIR to Advance American R&D

NRC complemented its SBIR assessment sequence in 2016 with *STTR: An Assessment of the Small Business Technology Transfer Program.* "STTR is meeting its congressional objective of fostering cooperation between small business concerns and research institutions, and does so in some respects to an extent that SBIR does not," NRC wrote[5] in this data-driven study. Noting significant agency application differences between STTR programs, NRC found that "To a considerable extent, STTR fosters private sector commercialization of innovations derived from federal R&D." What NRC explored, in SBIR or STTR assessments, is **technology commercialization, finding rates of between 45 to 70 percent** depending on the agency, and direct university collaboration between 33 and 63 percent of SBIR awards.

1.2 Different Agency Missions, Different Agency Outcomes

Because the SBIR/STTR statute defines the programs as Federal extramural R&D, expressed at the agency level[6] in their annual budgets, ownership of SBIR and STTR budgets – and program management, therefore – is vested in the assessed agencies. Consequently, each agency's SBIR/STTR program takes formal notice of that agency's mission, giving the SBIR/STTR program across 11 agencies a remarkably diverse character. SBIR/STTR is tailored by each agency, with results tracked and reported. The diversity also leads to opportunities for comparative evaluations towards continually improving best practices.

Missions and SBIR/STTR Topics: Diverse by Definition

Consider, for example, the formal missions of two agencies with prominent SBIR/STTR programs:

- "The mission of the **Navy** is to maintain, train and equip combat-ready naval forces capable of winning wars, deterring aggression and maintaining freedom of the seas."[7]
- "To promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense; and for other purposes. **National Science Foundation** (NSF) envisions a nation that capitalizes on new concepts in science and engineering and provides global leadership in advancing research and education."[8]

SBIR/STTR topics reflect these different missions. Agencies that don't procure advanced technologies may publish SBIR/STTR topics written generally to accord with their basic R&D interests on the leading edge of innovation – such as NSF or the National Institutes of Health within the Dept. of Health & Human Services. On the other hand, Dept. of Defense (DOD) agencies seek high quality R&D solutions for defense challenges, and issue precisely written topics with potential follow-on purchases of products and services designed to ensure that American warfighters are equipped for success in emerging battlefields.

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[5] *An Assessment of the Small Business Technology Transfer Program;* National Research Council; June, 2016; pp. 4-6

[6] By statute, and the accompanying *SBIR/STTR Policy Directive* published by the Small Business Administration, the SBIR assessment is taken for each Federal agency with an extramural R&D budget above $100M. The STTR assessment is taken for each Federal agency with an extramural R&D budget above $1B. The *Directive* provides detailed instruction on tracking and reporting.

[7] https://www.navy.com/about/mission.html

[8] https://www.nsf.gov/pubs/2014/nsf14002/pdf/02_mission_vision.pdf

Agencies such as the Dept. of Energy, which doesn't procure innovation but is focused on American energy needs, publish topics designed to guide innovation and extend promising applied research from DoE's national laboratories such as Los Alamos NM and Oak Ridge TN. NRC, in its SBIR and STTR assessments, has regarded such diversity as the program's backbone, and insurance that SBIR/STTR makes a broad, deep and practical contribution to American R&D. NRC studies have chronicled substantial SBIR/STTR commercialization at non-procuring agencies, evidence of the commercial vitality of SBIR/STTR technology solutions.

Missions and SBIR/STTR Commercialization Assistance: Diverse by Design, and Statute

Similarly, agencies have tailored assistance to SBIR/STTR awardees since 1999 in strengthening their small businesses to accord with entrepreneurial needs to achieve commercialization. Congress first mandated this in 2002 SBIR/STTR reauthorization by emphasizing the importance of project commercialization plans in evaluating SBIR/STTR proposals. But Congress went on to expand the commercialization focus significantly in 2011, authorizing agency pilot plans to accelerate SBIR/STTR commercialization for agencies other than the Dept. of Defense. Now all SBIR/STTR awardees have the option of using some award funds to hire technology commercialization experts.

Agencies that procure advanced technologies, led by DoD military departments, offer commercialization assistance that facilitates small business transition to DoD, including production capability and requisite certifications. Such DOD practices resonate with increasing warfighter and acquisition command acceptance of SBIR/STTR. Best practice examples include two Naval documents, *Tapping Into Small Business In a Big Way* – guidance issued in January 2015 by the Assistant Secretary of the Navy for Research, Development and Acquisition – and the *Dept. of the Navy SBIR/STTR Phase III Guidebook for Program Managers and Contracting Officers,* a 2014 Naval desk reference in standard use throughout Naval Systems Commands, and elsewhere in DoD organizations.[9]

Agencies that don't procure also select SBIR awards based upon anticipated benefit and commercialization potential. As these agencies achieve their missions when SBIR technologies reach the commercial marketplace, they also offer assistance to help small business identification of potential markets and customers and can further support successful SBIR projects through their regular agency R&D awards. The SBIR program currently only uses a very small fraction of agency external R&D – the remainder (some 97%) is spent with large businesses, national labs and universities on R&D. Yet some 38% of the nation's scientists and engineers work in small business, with high skill given the high levels of success. The non-procuring agencies could decide to further their mission achievement by opening up their regular R&D awards to the highest performing of their SBIR projects, the ones determined most promising to best support the agencies' missions. These agencies are also required by the 2011 reauthorization to make Phase III awards to the SBIR innovators "to the greatest extent practicable" to accelerate commercialization of SBIR/STTR technologies for domestic markets. Some agencies and departments have been slow to implement the provisions of the law.

While assessments of SBIR/STTR technical assistance curricula has varied, the consensus is that about 70% of all DoD and NSF SBIR/STTR projects receive non-SBIR/STTR commercialization investment or sales revenues, as do about 49% of all SBIR/STTR projects funded by NIH, NASA and DoE.[10]

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[9] Both documents are found at http://navysbir.com.

[10] *An Assessment of the SBIR Program;* National Research Council; April, 2008; pp. 59-60

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Amidst years of Congressional efforts to improve American R&D commercialization – including the Bayh-Dole Act among several pieces of legislation – SBIR/STTR has a continuous and steadily-improving record of successful technology commercialization.

1.3 Strengths and Improvement Areas

Principal strengths of SBIR/STTR are found in many areas:

- **Seed funding**: With per project funding of up to $3M available to its awardees across a wide swath of Federal agencies, SBIR/STTR is a unique **seed fund for American technological innovation**, investing at the earliest stages in technologies that are pre-commercial and prior to stages at which Venture Capital is interested. Awards are strictly merit-based in this highly competitive program with only 1 in 20 proposals reaching Phase II, and the program's success supports American economic revitalization.
- **Uniquely American approach to draw on the energy of technology entrepreneurs**: The SBIR program taps American entrepreneurs and the 38% of our scientists and engineers employed by small business to solve Federal agencies' most important long range technology challenges and opportunities, and to create new products and services in the small businesses that create most of America's new jobs.
- **Jobs driver**: With the current studies of agency SBIR economic impact, this program emerges as a very **significant jobs-and-wages engine** for regional economies nationwide, where the multiplier effects of the new products and services create ripples of growth as dollars turn over within that region.
- **American manufacturing on-ramp:** Congressional emphasis on delivering SBIR/STTR innovation to warfighters and domestic user alike, SBIR/STTR enables small business to experiment with prototype development from promising R&D, followed by scale-up to actual product manufacture. Further, SBIR/STTR has links to key Federal advanced manufacturing and additive manufacturing programs.
- **Intellectual property development:** Intellectual property is the bedrock for good American jobs, and the number one indicator of regional wealth. The SBIR program is focused on developing IP.
- **High impact R&D program**: With commercialization of innovative R&D as an SBIR/STTR objective, a high commercialization rate, and a history of growing tech firms with global clout, the program invests ~$2.5B annually in **practical R&D, creating new industries such as robotics, MEMS, additive manufacturing, and new medical devices**, in addition to revitalizing old industries. Although SBIR/STTR is less than 3.5 percent of Federal external R&D, it's proven capable of delivering useful innovation in the form of products and services. Further, such practical R&D is the work of an otherwise underutilized American asset: small business science/engineering skill.
- **Technology-driven cost-savings**: With economies in cost, prototype scale-up and production, SBIR/STTR can generate **critical cost savings** – as has been noted by the American defense sector[11]:
  - **F-35 Lightning II fighter plane**, according to Air Force Lt Gen Chris Bogdan, has realized more than $500M in cost savings to date through use of SBIR/STTR technology and manufacturing solutions – a bright spot in an otherwise gloomy fiscal picture.
  - The **MRAP vehicle** that saved lives in Iraq and Afghanistan, according to Army and Marine Corps sources, realized a 90% savings in live-fire testing through use of SBIR/STTR technology.
  - The ***Virginia*-class submarine**, according to Naval Sea Systems sources, realizes cost savings and avoidance of ~$1M per hull by using one SBIR project's technology in the boat's communications system alone, and millions more with SBIR/STTRs in additional submarine systems.
- **New startup formation and technical business help**: SBIR/STTR is a **virtual incubator for entrepreneurs** in remote rural areas, dense inner cities, and anywhere else economic revitalization is needed. SBIR/STTR administrative funding encourages such new entrepreneurship. **Innovation partnerships**: With its links to

[11] Cost saving/avoidance detail for DoD ACAT Programs is available from appropriate MILDEP SBIR/STTR Program Offices on request, and from the Secretary of Defense (OSD) Office of Small Business Programs.

government, university, laboratory and industry partners, SBIR/STTR is a unique **venue for collaborations of regional or national R&D stakeholders** – the seed corn for domestic economic vitality.

- **Competition:** With rigorous emphasis on innovation and competition at Phases I and II, SBIR/STTR levels the playing field between experienced R&D practitioners and fresh "garage-stage" entrepreneurs. Year in and year out, about 30 percent of SBIR/STTR awardees are first-time winners, NRC found.

Areas for SBIR/STTR improvement touch on six frequently discussed issues[12]:

- **American small business employs 38 percent of our scientists and engineers, but receives only five percent of the Federal 135 billion dollar R&D budget, with the SBIR/STTR programs comprising only 1.7%.** This misses the historically-demonstrated American potential for technology and jobs growth represented by our entrepreneurs and small businesses, and compares poorly competitively with the European Union's current 16.9 percent direct award of EU R&D work to small business. As basic science has grown more complex and innovation has increasingly required both high levels of technical skill and entrepreneurship, our continuing underutilization of America's small business engineers, innovators and job creators in Federal R&D misses a primary opportunity to strengthen our economy.
- **Updating and streamlining of the Federal Acquisition Regulation** is needed to simplify the SBIR process.
- **Small business R&D goals required in the law need to be implemented and enforced.**
- **Non-DoD domestic agencies, given Phase III authority and commercialization encouragement by 2011 SBIR/STTR authorization, should consider how to further development of their most successful SBIR/STTR projects.** While DOD has opened up its non-SBIR R&D programs for follow-on projects to successful SBIR Phase IIs funded with their large regular R&D budgets, the non-DoD agencies in general have not supported such follow-ons. The data suggests this may be short-sighted, especially as venture capital remains focused on more advanced technologies that have near term commercial potential. Naval and Air Force success with SBIR/STTR Phase IIIs, plus the success of the Rapid Innovation Fund and its high number of applicants, have demonstrated the effectiveness of available sources of Federal follow-on funding for advancing SBIR/STTR technologies.
- Statute authority for **DoD components to promote Phase III awards "to the greatest extent practicable"**[13] should be implemented through a combination of better education of acquisition personnel[14], better reporting of Phase III awards including capture of non-Federal investment, performance monitoring by the Government Accountability Office, and incentives to core acquisition personnel. Expediting of required sole source contracting of Phase III projects will save costs by both Government and small business contractors by eliminating time wasting inefficiencies.
- The Government-Industry Advisory Panel should work to **ensure data rights and patent protections for small business inventions**. This includes Panel work regarding rights in technical data, the validation of proprietary data restrictions, and the regulations implementing such sections. Protecting this intellectual property will help stop the bleeding of important American inventions and associated jobs to foreign nation competitors. Any requirements of Broad Agency Announcements (BAA) requiring relinquishment of these data and patent rights should be prohibited.

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12 *How Congress Can Help SBIR Companies Create Jobs;* Small Business Technology Council; June, 2014, http://sbtc.org/wp-content/uploads/2014/06/SBTC-White-Paper-June-25-How-Congress-Can-Help-SBIR-Companies-Create-Jobs-6-20-2014.pdf

13 Section 638, title 15, United States Code (15 U.S.C. § 638 [2012]),1 subsection r(4)

14 See, for example, *SBIR and STTR Phase III Guidebook for Program Managers, Contracting Officers and Small Business Professionals;* Naval SBIR/STTR Program Office; May 2016.

- **The shrinking of the Federal R&D base also causes the jobs-creating SBIR allocation to decrease proportionately**. Combined with the 2011 inflation catchup boost in the size of Phase I and II awards, this has led to a decrease in the number of awards. With a relatively steady over time 1 in 8 Phase I proposals selected for a proof-of-concept award, and only 1 in 20 advancing to Phase II, together with rapidly increasing proposal costs for meeting increasing proposal administrative requirements and arbitrary financial restrictions raising business costs, the number of proposals has also decreased proportionately with the awards. There appears to be substantial innovation capacity in the nation for many more high quality proposals if the SBIR budget could be increased and red tape could be cut.
- **American technological competitiveness is based upon entrepreneurship and R&D, and should be ensured through increased R&D and SBIR/STTR funding**. R&D funding as a percentage of GDP shows a decline of over 60% percent over the last four decades, as seen in **Figure 3**, below. Federal R&D spending has fallen about 70 percent as a percentage of the Federal budget in the last 50 years, as seen in **Figure 4**. Importantly, this decline may correlate with the troubling downtrend trend of participation by new companies in the nation's high-tech sector, seen in **Figure 5**. Because it's now a given that small business is the American jobs engine, this downtrend is of special concern. Investment in R&D is a critical priority we can have for high quality job and wealth creation as patents are the number one indicator of high wage jobs and regional wealth. [15]

In an age of increased global competition, including competition with increasingly capable allied nations as well as a world of developing nations offering lower wage costs, America cannot afford an R&D and innovation deficit among our best job creators. SBIR clearly provides more bang for the Federal R&D buck than any other innovation program.

[15] See Federal Reserve Bank of Cleveland, "Altered States: A Perspective on 75 Years of State Income Growth," *Annual Report 2005*. For more detail, see Paul Bauer, Mark Schweitzer, Scott Shane, *State Growth Empirics: The Long-Term Determinants of State Income Growth*, Working Paper 06-06, Federal Reserve Bank of Cleveland, May 2006,

https://www.clevelandfed.org/en/Newsroom%20and%20Events/Publications/Working%20Papers/2006%20Working%20Papers.aspx and then Click on the PDF for WP-06-06 by Bauer *et. al.*
See also, Patenting Prosperity: Invention and Economic Performance in the United States and its Metropolitan Areas Jonathan Rothwell, José Lobo, Deborah Strumsky, and Mark Muro. Being in a high patent region adds $4,300 per worker to annual income, which is $8,600/year for a two worker household. http://www.brookings.edu/~/media/research/files/reports/2013/02/patenting-prosperity-rothwell/patenting-prosperity-rothwell.pdf page 15.

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- **Figure 3 – Federal R&D Funding as a Percentage of Gross Domestic Product**

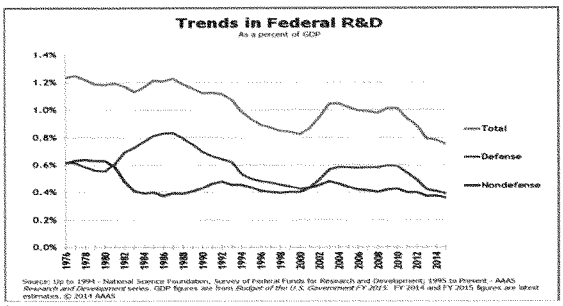


Figure 4 – Federal R&D Funding as a Percentage of the Federal Budget

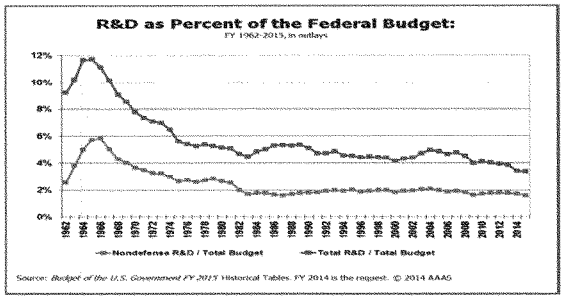
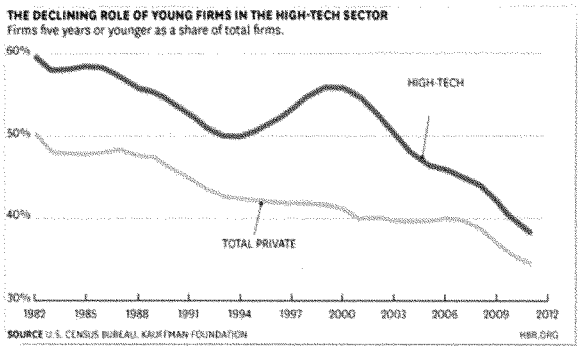


Figure 5 – Declining Role of New Technology Companies



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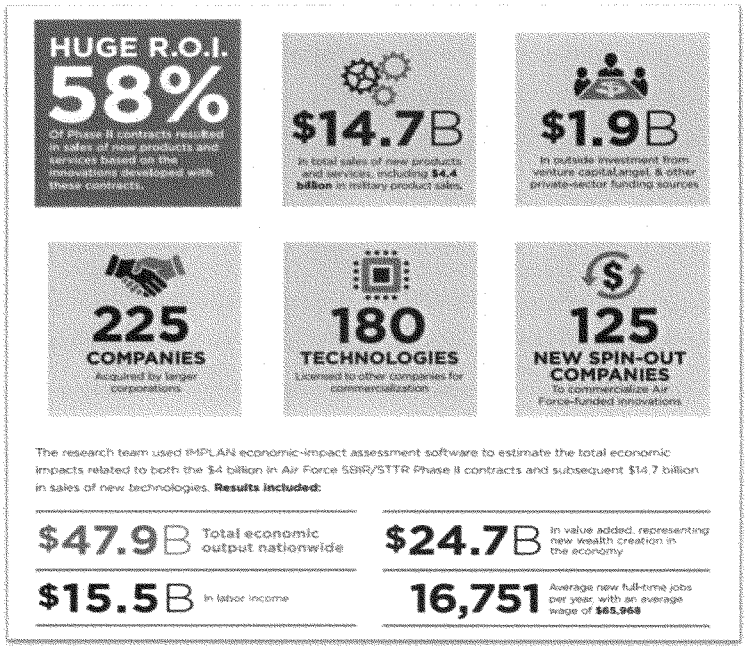
1.4 Economic Impact

SBIR/STTR programs of the Army, Navy/Marine Corps and Air Force began in the late 1990's to assess success and publish short "success stories" of SBIR/STTR technologies transitioning into DoD platforms and systems[16]. Typically, these have averaged one per month, and non-DoD agencies including the Small Business Administration have emulated such publication as a performance measure.

In 2014, however, the Air Force SBIR/STTR Program took the unprecedented step of commissioning an assessment of the economic impact of its Phase II investments over the period 2000 – 2013: a performance measure of significance for American economic revitalization. The extraordinary results, depicted below in **Figure 6**, an infographic from the study[17], immediately came to Congressional attention. (*Note:* the results below are understated in that they do not capture the sales and jobs effect that Air Force SBIR/STTR technologies had on licensees or acquirers of these technologies.)

Figure 6 – Air Force SBIR/STTR Economic Impact, 2000 – 2013



[16] See, for example, http://www.navysbir.com, or http://www.afsbirsttr.com, or https://www.armysbir.army.mil

[17] *The Air Force Impact to the Economy Via SBIR-STTR;* US Air Force SBIR/STTR Program Office; 2015, https://www.sbir.gov/sites/default/files/USAF%20SBIR-STTR%20Economic%20Impact%20Study%20FY2015.pdf

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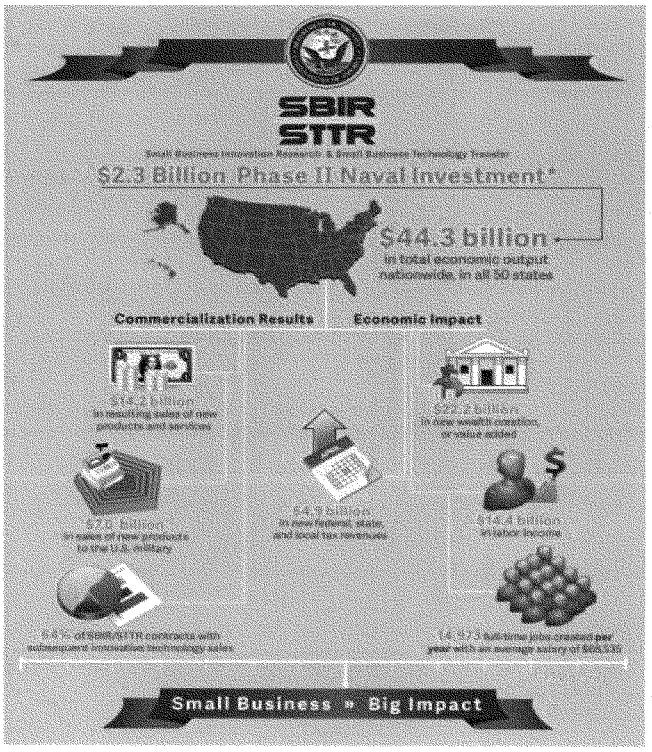
After publication of this revelatory study, the Dept. of the Navy SBIR/STTR Program engaged the same research firm to apply a refined data analytics model to its own record of Phase II investment for the same period, 2000 – 2013. While the Naval and Air Force SBIR/STTR Programs are not exactly comparable, the Navy results[18] (**Figure 7**) showed the same profound economic impact of job creation, high wages, and multiplier effects in regional economies – plus Federal tax revenue data showing that Naval SBIR/STTR Phase II investment of $2.3M returned $3.5M in taxes to the US Treasury – suggesting that SBIR/STTR Phase II investment paid for itself with a hefty cash return on the investment, in addition to the impacts of the technologies on performance and costs and the jobs/wages benefit. Also, by generating more than $0.71 in state and local taxes for every dollar invested by SBIR, it strengthens the local communities where SBIR investments are made.

Figure 7 – Naval SBIR/STTR Economic Impact, 2000 – 2013



[18] *Small Business > Big Impact: Naval SBIR/STTR Investment 2000-2013;* Dept. of the Navy SBIR/STTR Program Office; 2016

Both the Air Force and Naval SBIR studies had a higher response rate (>90%) from queried small firms than did any of the NRC studies. Further, these two studies developed broader and more meaningful metrics in showing the value of SBIR commercialization and job creation.

With additional Federal agencies looking at SBIR/STTR's economic impact, President Trump and the 155th Congress can expect to see data arguing that the SBIR/STTR contribution to American R&D is more than great technology: it is jobs, high wages and strong regional impact to support economic revitalization.

2. SBIR/STTR: Dramatic, Lasting Impact on the American Economy

Technology drives opportunities for sustainable economic advantage and offers a path to preserve America's high value jobs and wealth. The 21st century economy is driven by technology, and jobs and fortunes will be made or lost based upon the flows of technology. The 2016 American elections highlighted America's economic tensions as we work to preserve our standard of living while much of the world seeks to raise its standards. To sustain America's strength we need to continue to invest in R&D and to innovate new technologies. SBIR/STTR provides a demonstrated capability to do fulfill the larger promise of American R&D, via national economic revitalization. The 115th Congress, as it takes up SBIR/STTR improvement and the larger issue of R&D revitalization, can be expected to view this landmark, high-achieving program through a new lens of opportunity for American defense/security, American energy, and American public infrastructure.

2.1 Driving Role of Technology in the Economy

The story of post-1945 global trade shows successive waves of nations rising to challenge older economies, partly through lower labor costs but mostly through integration of technologies that hiked productivity, lowered manufacturing costs, and accelerated product delivery.[19] While new science such as robotics eliminates older assembly jobs, new technology jobs at higher wages are created[20].

What SBIR/STTR has done already to buoy the defense, space, energy, IT and bioscience industries, it can do for other American industries such as infrastructure construction – with robust economic benefits.

2.2 From Basic Science to Innovation, Jobs and Products

Practical innovation – a good working definition of SBIR/STTR – is necessary to transform basic science into useful products and services. With his light bulb innovation, Thomas Edison took electrical current science to a life-changing level. SBIR/STTR topic problems, whether from the Dept. of Agriculture or the National Cancer Institute or other agencies, challenge entrepreneurs to apply science and engineering skills to development of innovative "form/fit/function" solutions. SBIR/STTR, through its seed funding, technological mentoring and commercialization assistance, provides the juice for such solutions.

These American-bred solutions, born of basic science through R&D, lead to substantial well-paying American jobs, and to the revenues that keep American regional economies spinning and growing. While the SBIR/STTR statute is silent on regional economic benefit, small businesses see themselves as local players linked to local economies to provide goods and services essential to business growth, and to universities or similar STEM talent sources to provide employees. An SBIR business's jobs also tend to stick to the regions where they were created.

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19 *Making America 1953 Again;* Washington Post; December 29, 2016

20 https://techcrunch.com/2016/05/13/robots-wont-just-take-jobs-theyll-create-them

SBIR fills a key gap in America's innovation economy, the often-long and risky path from fundamental science to products. America's universities are excellent at developing fundamental basic science and research, using some 35% of Federal external R&D. But converting basic science to innovations for new products and services and jobs is a bottleneck in the pipeline. VCs and major companies tend to not tackle early stage innovations, seeking product opportunities with most of the technology risk removed. This leaves an innovation gap, between basic science and marketable products.

Bank lending to small business remains severely depressed: since 2008 lending to small business has declined by $99B, with many big banks that received TARP recession recovery funding abandoning small business lending. Venture capital investment for seed funding, and investment beyond Silicon Valley, has decreased dramatically. Since 2008 venture capital has declined for first-round financing in particular, and for early stage investment generally. In 2015, venture capital only made 185 seed-round deals; Contrast this with the SBIR/STTR program that makes almost 5,000 awards each year. Also, venture investments are principally made in two states, California and Massachusetts, and are concentrated in very few industries. 85 percent of VC funding is provided to just five states, and 60 percent of the total funding goes to California. For most small business in most of the nation, then, venture capital it not a realistic option to grow and commercialize their inventions.

Other countries have taken advantage of our imbalance to reduce America's technology lead, driven by more directed STEM-driven economic development mandates, lower labor costs, and building on American science. For example the European Union has now increased to over 16.9% the target R&D proportion provided directly to small businesses, about five times America's overall 3% of Federal R&D expenditures (the majority from SBIR). Seventeen other countries have copied the SBIR program in their countries. The Federal SBIR program seeks to release our innovation pipeline imbalance, unleashing entrepreneurial drive to create future jobs. SBIR combines agency-identified mission priorities with small business entrepreneurially-driven innovation, led by risk-taking entrepreneurs and private sector research leaders (often from universities or other large research organizations), and advancing our nation's basic science into novel applications and products.

The SBIR program targets this current bottleneck in America's innovation pipeline. Results have shown the high payoff from focusing a very small portion of the Federal R&D budget upon agency-identified challenges to unleash the entrepreneurially-driven energies of our small businesses. These businesses are led by risk-taking small business entrepreneurs and research leaders, often originally from universities or other large research organizations. 60% of SBIR projects involve at least one founder with a university background, and formal small business-university SBIR collaborations are growing, now at 35-50% depending upon agency. All STTR projects involve collaborations between small businesses and research institutions. Our small high tech businesses are driven to commercialize and grow, and efficiently convert science into innovation and jobs needed for our tech economy. The result is SBIR's high innovation productivity: using only 3.4% of the external R&D budget (1.7% of the budget overall) to produce 22-25% of the major innovations, 5500 patents/year, and a stream of new products, services, and high quality jobs.

The U.S. needs more small business-driven innovation to help build a stronger America that can continue to out-compete the world. Small businesses by their entrepreneurial private sector nature do this well, creating over two- thirds of the net new jobs in the past 15 years. America needs more SBIR awards to transition more science and technology to innovations, patents, products and high quality jobs.

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2.3 SBIR/STTR and Collaborative Economics

If Silicon Valley gave the world the winning concept of "collaborative advantage", it's fair to say that SBIR/STTR takes that concept operational nation-wide through a collaborative model that links small and large business, government labs, universities and other technology stakeholders. These collaborations on SBIR/STTR projects address current and future American technology needs while establishing a vibrant regional root structure of productive and well-paying STEM-derived jobs and revenues, supporting American economic vitality. And the attainment of significant Phase III outcomes relies upon the entrepreneurial energy and investments of the small businesses in advancing their SBIR results towards commercial sale.

2.4 Broadening the Impact:

Sensing that SBIR/STTR benefits weren't equitably distributed throughout America, Congress acknowledged this in its 2011 SBIR/STTR reauthorization, mandating outreach to underserved populations and regions and related improvements to ensure greater SBIR/STTR commercialization outcomes consistent with continued reliance upon merit decisions in selecting proposals.

In response, SBIR/STTR used special administrative funding from the statute to launch "SBIR Road Tours: Seeding America's Future Innovations" in nearly 20 states, in a concerted effort to spread program benefits nation-wide. In parallel, the Dept. of Commerce launched 35 tech-focused "Rapid Innovation Clusters" – many in greater Rust Belt regions. And numerous universities began forging regional partnerships to commence "innovation institutes" to navigate STEM entrepreneurs through the startup "Valley of Death". Further, in some Rust Belt states where the return of traditional blue-collar manufacturing jobs is problematic, "innovation corridors" are springing up to grow emerging industry opportunities in new fields such as robotics, additive manufacturing and bioscience that offer high value jobs for the future.

This outreach is still new, but is showing potential for broadening the impact of SBIR across all of America. While the issue is partly the result of the general STEM issue, opportunities offered by the SBIR/STTR program together with improved outreach can also be used to help advance America's STEM initiatives.

SBTC
Small Business Technology Council

3. Recommendations

Federal legislative and agency action could remove roadblocks restraining full achievement of SBIR/STTR potential, and prepare the path forward to American economic revitalization. The small business community, which creates most American new jobs and makes up 99.7% of U.S. firms, asks Congress to take the following actions to strengthen American competitiveness and jobs and to maximize the SBIR/STTR effectiveness:

A. Substantially increase the SBIR/STTR allocation of Federal R&D. This will increase innovation development and increase the impact on the economy, at no increase to the Federal R&D budget.

B. Keep America in the forefront of high technology by growing America's long term investment in R&D.

C. Insist that the SBIR/STTR statute's Phase III emphasis (and SBA Policy Directive implementation guidance) be fully implemented by all federal agencies with SBIR/STTR programs.

1. Ensure that all agencies have policies supporting the SBA Policy Directive on SBIR/STTR, promulgating Congress's intent under SBIR legislation.
2. Modify 15 USC 638 to require full implementation of SBIR/STTR Phase III rules, to further reinforce the "to the greatest extent practicable" requirement.
3. Federal agencies' Phase III actions should be taken as required by law – "to the greatest extent practicable", and should be tracked fully, in real-time, and reported by agencies and prime contractors.
4. The Federal Acquisition Regulations, FAR agency supplements, procurement manuals and procedures should be revised to implement the 2011 SBIR/STTR statute, with training and oversight procedures developed and executed to ensure implementation.
5. Create goals and make incentives available to agency Program Managers, Contracting Officers, ACOs, Contracting Officer Representatives, prime contractors and others to ensure proper recognition and pursuit of SBIR/STTR objectives.
6. Revise the law to require that at least 25 percent of the members of the Defense Business Board represent small businesses.
7. Require that the military departments use part of their 3% money to provide expedited security clearances for SBIR companies during early (pre-classified) research programs to prepare new small firms for classified work and accelerate incorporation of new technologies into weapons programs.

D. Reduce paperwork/administrative burden relating to proposals, contract administration and accounting, and reconsider financial restrictions placed on SBIR awardees.

1. Proposal requirements are becoming increasingly time-consuming and inflexible, boosting costs while creating administrative hurdles separate from the primary purpose of seeking high quality innovation.
2. Contract requirements are heavily burdensome especially for small SBIR businesses. Requirements streamlining will access a broader range of potential innovators while reducing red tape and paperwork burdens on the work.
3. Increasingly SBIR awardees are facing financial restrictions in the forms of requirements for meeting large company accounting rules and at some agencies in overhead restrictions set to exclude the highly capable and integrated small businesses that characterize advanced innovation. Acceptance of simplified but accurate accounting procedures and contract vehicles as well as eliminating overhead caps will help meet the rapid pace of modern innovation while better focusing on the work itself.

E. Retain the DoD Rapid Innovation Fund (RIF) program exclusively for its original purpose of DoD SBIR Phase III transition, and develop similar programs for other agencies.

1. Continue the originally proposed $500M in RIF funding solely for SBIR Phase III work.
2. Initiate a new stimulus program for "Fly-Over" non-VC states, funding an additional $1B stimulus to SBIR companies in non-VC dominant states (other than California, Massachusetts, New York, Texas, Washington State, and Washington DC) for 500 - $2M Phase III SBIR programs.
3. Since every $1 invested in SBIR returns $1.46 back in Federal taxes, it should be clear that SBIR is a net addition to the tax base and thus an overall reducer of the deficit and national debt.
4. More generally, reconsider non-procurement agency practices that fail to track Phase III success metrics, provide inadequate Phase III policy or transition follow-up, and discourage small business participation in non-SBIR regular R&D programs, such as barriers to contracting, high administrative burdens on proposals and contracts, and cost-sharing requirements.

F. Maintain strong intellectual property protection for SBIR/STTR innovations throughout Phases I-III.

1. With intellectual property a primary small business asset, patent law changes to support patent development and issuance to innovators as well as patent valuations will help justify increased entrepreneur and outside investment. Patents protect American jobs, and patent reform must ensure that small business innovation is not crushed by the interests of large businesses. Small business innovation and its resulting patents are core drivers for America's high value production and standard of living. The small business technology sector must be given a voice in the development of such laws.
2. Protect the proper allowability of patent expense in SBIR awards.

G. Require the agencies create small business goals for their Federal R&D expenditures.

H. Allow agencies currently not currently included in SBIR (e.g. the VA, iARPA) to join the program.

America remains the world's powerhouse of science, entrepreneurship and innovation. But the world is at our heels, seeking also America's economic dream, and competing hard to gain it with increasing investments in education, R&D and industrial development, and from a much lower wage base. For America to hold and grow its position, we need to reinvigorate our investment in our economic effectiveness and in the drivers that have built our economy: science, R&D, a highly educated workforce, entrepreneurship, innovation, intellectual property, and private enterprise. The SBIR/STTR program offers a well-tested and demonstrated base addressing national technology challenges and enlisting American small business entrepreneurs, scientists, engineers and STEM workers to convert our strong basic science into innovations to re-energize our core industrial and service industries. The recent studies show this effectiveness, and start to quantify the remarkably strong response it is causing in our economy, building new businesses, creating new products and services, and growing high quality jobs. We invite Congress to build upon this entrepreneurial Federal program to help further build America.

❖ *Please send any inquiries to alec@sbtc.org*

SIMETRI

Improving the Small Business Innovation Research and Small Business Technology Transfer Programs

Testimony before the House Subcommittee on Contracting and Workforce of the Committee on Small Business and the Subcommittee on Research and Technology of the Committee on Science, Space, and Technology

Angela M. Albán Naranjo
President & CEO
SIMETRI

May 4, 2017

Good morning, Chairman Knight, Chairman Comstock, Ranking Member Murphy, Ranking Member Lipinski, and Members of the Committees. My name is Angela Albán Naranjo and I am the President and CEO of SIMETRI, a small women-owned, minority-owned business based in Winter Park, Florida and currently participating in the Small Business Innovation Research (SBIR) Program. Thank you for the opportunity to discuss the SBIR Program and Small Business Technology Transfer (STTR) programs pursued by SIMETRI, the role these programs play in allowing small businesses such as mine to develop innovative intellectual property that promotes more rapid technological innovation and economic growth in our communities. My remarks will focus on my personal experience as a small business owner involved in the SBIR and STTR programs. It is my opinion that the SBIR and STTR programs are ideally suited for creating opportunities for small businesses throughout our country to stimulate technological innovation and economic growth. These programs have afforded me the opportunity to grow our team and capabilities, have made us more competitive and allowed us the opportunity to achieve our mission statement: Improve medical outcomes through innovative training technology development.

I want to share our company's story and how participation in the SBIR program has fostered our growth and internal development, but first, I want you to understand how small our business truly is and how it started, so that you can witness how this program can transform lives and communities. I was born in Colombia and emigrated to the United States with my parents when I was five years old. I dreamt of becoming a physician, but while pursuing my undergraduate degree at Emory University, I realized that I wanted to make and break things, so I became an engineer. I came home to Central Florida, attended graduate school at the University of Central Florida and began working for a defense contractor as a Simulation Engineer. By the time I had my children,

I wanted the freedom and flexibility that came with being a small business owner, but most importantly, I aspired to become an honest and fair employer that inspired trust and innovation. I started my company in 2009 as a consultant and within a couple of years, we were awarded direct contracts with the U.S. Army developing new technologies and capabilities for medical training. By 2014, we were awarded our first Phase I SBIR contract. This contract marked a milestone for our company and allowed me to pursue more competitive research and development contracts. It enabled me to hire the right staff and develop foundational processes, methodologies, and technologies that prepared us for future work. Today, we employ twelve individuals, a family of dedicated workers drawn from different professional backgrounds whose culture and focus is built around the same goal: improving medical outcomes by developing innovative training technologies.

SIMETRI'S PARTICIPATION IN THE SBIR PROGRAM

The U.S. Army Research Laboratory Human Research and Engineering Directorate Advanced Training & Simulation Division (ARL-HRED ATSD) develops and matures affordable new technologies for simulation-based training. In support of these research and development efforts, ARL-HRED ATSD contracts with solution providers to develop technology, tools, and techniques for more effective medical training for Army personnel.

One such training gap is in the field of intraosseous (IO) infusion. Traumatic life-threatening injuries often require the immediate delivery of fluids and medications. The hazards of combat environments present new and heightened difficulties in delivering these lifesaving fluids and medications through intravenous (IV) access, especially during the treatment of critical injuries.

Medics, nurses, and physicians are highly trained in obtaining intravenous access, but when access is difficult or altogether impossible to achieve, alternative methods for administering fluids and medications are essential. IO infusion is a technique used to access blood vessels within the bone marrow, which is concealed in a rigid, structured bony wall. Unlike the body's peripheral veins, the IO space does not collapse when the patient is in shock (Communicore, 2006). Humeral Head IO (HHIO) infusion is the process of injecting fluids and medications directly into the marrow of the humerus to provide a non-collapsible entry point into the circulatory system. This technique is used in emergency situations to provide fluids and medication quickly, when IV access is not available or not feasible (Tobias & Ross, 2010) as depicted in Figure 1 (Teleflex, n.d.).

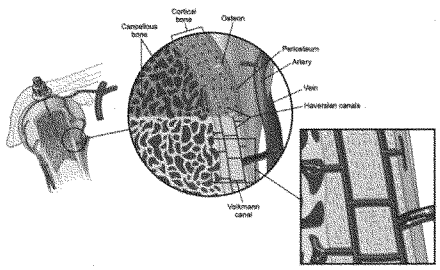

Figure 1. Rapid Infusion of Medicines and Fluids

Medications administered intraosseously reach the heart in less than thirty seconds, and the U.S. Army currently utilizes the EZ-IO Intraosseous Infusion System for HHIO insertions to deliver fluids in critical care situations. An insertion time by trained operators of as little as 20 to 40 seconds makes this technology particularly attractive for use on the battlefield to reduce casualties (Weiser et al., 2012; Carness et al., 2012; Sarkar & Philbeck, 2009). Even though the use of IO infusion was prevalent within the U.S. military during the Second World War, its use faded with the introduction of the plastic IV catheter. IO infusion re-emerged as a viable field alternative to

IV fluid introduction during the recent conflicts in Iraq and Afghanistan. As of 2010, the U.S. Committee on the Tactical Combat Casualty Care (TCCC) guidelines recommends using IO infusion in any resuscitation scenario in which IV access is not feasible (Weiser et al., 2012). Combat medics, flight medics, battalion surgeons and physician assistants deliver medical care from the time of injury through the battalion aid station, or brigade support medical company, until the injured soldier is delivered to surgical care. By making IO insertion training available to all soldiers, the Army can expect to see a reduction in casualties through the appropriate use of IO devices in the field.

This training imperative gave rise to the need for a low-cost, hands-on training system with sufficient fidelity to train soldiers effectively in the field use of IO devices for humeral head insertions, and provide them with "muscle memory" for this task. To meet this requirement, ARL-HRED ATSD created a Small Business Innovative Research (SBIR) Phase I Topic to develop a prototype, proof-of-concept device that demonstrates the feasibility of meeting the Army's expectations for a HHIO Insertion Part Task Trainer (PTT). My company, SIMETRI, Inc., was awarded a Phase I SBIR contract in June 2014 and subsequently, a Phase II SBIR contract in May 2015 to develop a prototype PTT that teaches students to find the correct anatomical landmarks, to insert the IO needle at the correct location and proper angle, to verify proper insertion, and to prepare the catheter correctly to introduce fluids. Relying on Subject Matter Experts (SMEs) and ARL-HRED ATSD personnel, SIMETRI conducted the research, design, and validation of Phase I and Phase II HHIO PTT prototypes that addressed the specific learning objectives desired for Army medical training in proximal HHIO insertion. The prototype PTT developed during Phase I of the SBIR effort consisted of an arm only, with appropriate structures and characteristics. The

Phase II SBIR prototype consists of a torso with two arms that articulate, allowing the trainee to position the arms as they would prior to performing the procedure. The design process focused on durability, realism, reusability, and low lifecycle costs.

The Phase I research culminated with SIMETRI delivering a prototype single-arm humeral head HHIO PTT (Figure 2) which was well received by users. The prototype development focused on providing an accurate simulation of the humeral head IO procedure, and was shown through usability testing to have been successful. Follow-on research continued to develop this proven technology into a commercially viable device, implementing additional features requested by end users while preserving the focus on affordability, durability, reliability, reduced lifecycle cost, and user-friendliness.

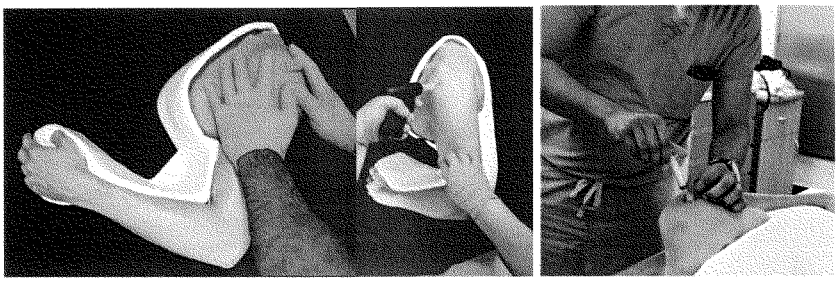

Figure 2. SIMETRI's Single-Arm HHIO PTT Delivered for the Phase I SBIR Contract.

Building on the successes achieved during the Phase I effort, the objectives of the Phase II SBIR effort were to improve the Phase I prototype PTT for real-world use in the field, and to incorporate the recommendations, findings, and new requirements elicited from military and civilian end users and Subject Matter Experts (SMEs) from the Phase I effort. Leveraging the lessons from the Phase I device, the Phase II PTT (Figure 3) was enhanced to provide appropriate feedback to student

actions, with adverse effects when common errors are committed as well as visible results to represent success, so that proficiency can be observed and judged. The PTT allows a trainee to locate the anatomical landmark (humeral head), firmly seat the catheter, observe blood on the stylet tip, note blood at the catheter hub, aspirate blood or marrow from the humeral head with a syringe, and introduce drugs or fluids flow, all while providing tactile and pressure cues that simulate the real-world scenario.

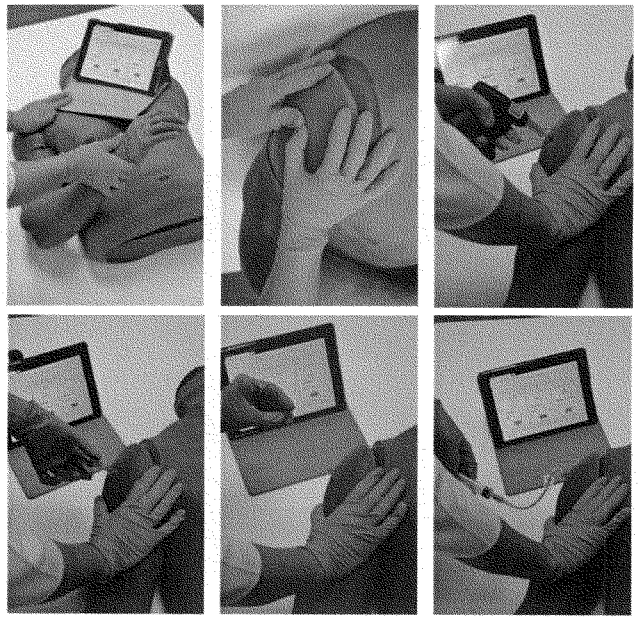

Figure 3. SIMETRI HHIO Part Task Trainer

During the Phase II SBIR effort, SIMETRI began utilizing 3D printing with additive materials such as high strength fiberglass and carbon fiber to reinforce components to strengths not typically seen in traditional 3D printing. The carbon fiber and fiberglass additives have provided sufficient

strength to these sub-assemblies to the point that they now replace traditional manufacturing techniques requiring machining of steel or aluminum. SIMETRI has replaced several of the Phase II PTT sub-assemblies with components that are now manufactured in house through additive 3D printing.

Use of 3D printing has now become a staple of any design and development effort that SIMETRI undertakes. 3D printing was used to advance the design of the Phase II PTT to achieve the accurate movement of the left and right arms, which in turn position the greater tubercle of the humeral head, achieving a major requirement in Phase II. These components were initially planned for machined aluminum but were quickly replaced with the additive 3D printing techniques when the cost of modifications and updates were factored in. Also, the rapid prototyping available through 3D printing allowed for the continuous improvement of the components with minimal cost impact to the final product. Use of 3D printing has also provided other opportunities and has been utilized to create support equipment used in the manufacturing process, molds for analyzing form, fit and function, and "positive" components that are then used to craft molds of reproducible/consumable components.

As part of the SBIR Program, SIMETRI recently submitted a proposal for a Second Phase II of the HHIO PTT that will build upon the results from the successful Phase I and Phase II efforts and culminate in an expanded and improved version of the Phase II prototype with additional capabilities, higher fidelity, greater user-friendliness, better reliability, and a specific design for commercialization. SIMETRI will leverage the lessons learned from the Phase I and Phase II efforts and continue to refine the HHIO PTT such that it can provide the best-available training

platform for the Army's medics, nurses and doctors, and be commercialized and transitioned to the civilian marketplace.

BARRIERS TO ENTRY INTO THE SBIR AND STTR PROGRAMS

Obtaining an SBIR or STTR award is very desirable to a small business because it presents an opportunity to develop technology while also growing a collaborative relationship with the federal government's representatives. In some cases, these awards afford small businesses an entry into working directly with the federal government while developing a technology that addresses an emerging need. At the same time, however, these awards are competitive, and every year there are more companies competing for a limited number of contracts. As a result, it is imperative that the small business familiarize itself with the problem space and the customer prior to the topics being officially released. Small business owners such as myself should also join with academic or other industry partners to ensure a competitive offering, since we typically do not have the depth of resources required to respond to some of the topics. Developing a network of partners is critical for a small business and we often find these partners in academia and industry. Although there are many opportunities for small businesses to develop these relationships, it is often a matter of time and resources. As a small business owner, we often have to prioritize our investments to maximize the return, and due to the highly competitive nature of these SBIR topics, the return is not immediate. In addition to securing the support of partners in academia and industry, we also secure support from the target industry for the technology being developed. Despite the fact that our company has successfully been awarded a Phase I and Phase II SBIR and soon a Second Phase II SBIR contract, we often submit proposals for new topics and are not selected as an awardee. We are cognizant of the value of these relationships and invest time and energy in cultivating the trust

required to convince partners to join our team. We also work with target industry partners to secure their interest and support as a part of our proposals. We focus our energy on pursuing topics in our market or adjacent markets to foster the confidence necessary for the Government customer to select our team. We work diligently throughout our local community to develop the relationships to grow our business to facilitate the commercialization of the proposed technologies. In our case, we are attempting to do the right thing to prepare our business for proposed work by fostering a corporate infrastructure that will position us for growth, but we are still not winning every proposal we submit because the stakes are high and the competition is often fierce. Some larger small businesses are leveraging internal investments in technology as a part of their proposed solution, thus lowering the risk for the Government during execution. Our company is not yet able to make these investments, but we intend to position ourselves to do so in the future.

WHAT DOES WORK

We only recently were notified that our Second Phase II contract would be awarded in the coming months. This additional funding will allow us to perfect a product that is completed but not necessarily optimized for commercialization and mass production. The SBIR and STTR programs are an excellent mechanism to rapidly innovate and prototype technologies, but they are not entirely sufficient to commercialize that technology into a long-term, sustainable product that can be accelerated into the final stages of R&D development in the period between discovery and commercialization. The scope and budget allocated to an initial SBIR Phase II effort are often based on estimates based on the nature of the technology and the complexity of the effort. There are often instances where those estimates are low. Under these circumstances, a Second Phase II effort should be considered to adequately mature the technology for transition and

commercialization. Such is the case with this Second Phase II award, as it will help mature the technology while developing the critical processes the federal government can leverage in the future.

Our company is very active throughout the Central Florida community to help build the network that we need to backfill areas of opportunity for growth. Fortunately, our community is focused on diversifying our economy through growth in the high-tech industry. Central Florida is known as the epicenter of Modeling, Simulation, and Training because the sector directly employs more than 30,000 Floridians with an average annual salary of over $78,000, contributing more than $6 billion to Florida's Regional GDP and more than $11.6 billion in state sales (economic output) activity. "Team Orlando" Commands employ nearly 2,800 military & civilian personnel in the Research Park that are all dedicated to advanced R&D and acquisition of simulation and training devices and other technologies. The most recent economic impact study estimates that the Modeling, Simulation and Training sector brings 73,802 jobs to Florida's economy (Lasrado, 2016). The National Center for Simulation (NCS), based in Orlando, Florida, is comprised of 244 Member Companies/Educational Institutions/Not-for-profit Organizations/Individuals (practitioners & students). Of the membership, 50% (122) are working with the federal government. Of those 122 organizations, approximately 50% are small businesses that are agile, innovative and creating many new jobs in Central Florida.

Our community is also home to the nation's largest university. The University of Central Florida provides the backbone of the high-tech industry in Central Florida. Most of UCF's graduates establish long term residence in Central Florida and many launch new enterprises in a community

with an eye on future growth. Central Floridians are fortunate to be surrounded by community leaders and programs that foster our growth and shore up our ability to develop and sustain high tech enterprises.

As an example, I participated in the UCF Business Incubation Program (BIP). Founded with a focus on technology innovation companies, the BIP routinely supports client company participation in the SBIR/STTR programs. Support services provided include a full-time staff member focused on assisting companies with evaluating their potential for business, preparing to do business with the government, finding and pursuing government business opportunities of all types, offering regular SBIR/STTR proposal preparation workshops, and providing comprehensive business incubation support meeting the variety of needs associated with starting and growing their companies while providing cost-effective facilities. Between 2000 and 2016, thirty-four (34) client companies have successfully secured over 130 Phase I awards and 60 Phase II awards, cumulatively valued at $63,800,000. At SIMETRI, we have received the BIP's assistance, and are grateful for what they have offered us and continue to offer us as a part of our network.

The Florida High Tech Corridor is an economic development initiative of the University of Central Florida, the University of South Florida and the University of Florida. Its mission is to grow high tech industry and innovation through partnerships that support research, marketing, workforce and entrepreneurship. A key program of the High Tech Corridor is the Matching Grants Research Program (MGRP) which fosters partnerships for applied research between high tech industry leaders and the three Corridor universities (UCF, USF, and UF). Every year, technology companies

bring their commercial challenges to expert faculty and leverage R&D budgets. An MGRP grant often helps in securing SBIR/ STTR grants for continued research and diversifies research funding for businesses in the 23-county region.

Since inception of the program in 1996, the High Tech Corridor has partnered with more than 360 companies on more than 1,400 research projects in sectors ranging from Agritechnology to Sustainable Energy. The more than $65 million in funds that have been invested by the High Tech Corridor have been matched by corporate cash and in-kind investments of $182 million, generating an additional $900 million in quantifiable downstream impacts and resulting in a total project value of more than $1 billion. Our company, SIMETRI, has been the recipient of several High Tech Corridor matching grants that afforded us the opportunity to include expert faculty on our team to amplify our ability to deliver the most innovative technology possible.

Based on the philosophy of Economic Gardening® — to grow existing businesses in a community, region or state — GrowFL, the Florida Economic Gardening Institute, is a critical component to the state's economic development strategy and Florida's entrepreneurial ecosystem. GrowFL was created in 2009 as an economic development program focused on helping scalable second-stage growth companies to prosper in the state of Florida. By providing strategies, resources and support to second-stage companies for next level growth through Strategic Research, Peer Learning and Leadership Development, GrowFL helps companies overcome obstacles to growth and leads them towards prosperity. GrowFL was the first nationally certified statewide Economic Gardening program by National Center for Economic Gardening through the Edward Lowe Foundation.

As of June 30, 2016, GrowFL assisted companies represent over 16,737 direct jobs across the State of Florida. In 2015, these companies had estimated regional sales of over $3.4 billion and contributed regional GDP of over $1.4 billion to the Florida economy. Between 2009 and 2015, a variety of state, local and private sector funding sources invested $8.04 million in the GrowFL program. The activities of this program over the same period helped generate an estimated 10,942 net new direct, indirect and induced jobs. GrowFL has assisted more than 900 companies through their Strategic Research and CEO Roundtable programs and recognized 300 successful entrepreneurs through their annual awards program, Florida Companies to Watch. SIMETRI is currently participating in the GrowFL program as a means to prepare for the commercialization of the SBIR technology being developed.

The Department of Defense (DoD) has created the Velociter program to support rapid transition/commercialization of DoD SBIR/ STTR technology throughout the life cycle of the SBIR/STTR programs. The program provides a variety of services through a program roadmap designed to support awardees in achieving their business goals by offering training resources, business coaching, opportunity analysis, pitch preparation, and competition matchmaking. SIMETRI was recently granted admission into the program because we have an active DoD SBIR/STTR Phase II contract and desire assistance in commercialization and transition. The DoD Velociter Program does not replicate, but, rather, enhances government-wide small business assistance programs facilitating SBIR/STTR. The DoD Velociter Program is sponsored by the DoD Office of Small Business Programs, which administers the DoD SBIR/STTR Program. Although the DoD has various service branch specific transition and commercialization assistance programs, the Velociter Program offers a unique one-on-one coaching program customized to the

needs of each SBIR/STTR awardee providing subject matter expertise in acquisition, intellectual property (IP), accounting, marketing, and contracting. The coaches are business strategy consultants in areas such as marketing, intellectual property, and commercialization. The program strives to assist the awardee with a customize a roadmap to help them advance business goals toward transition and/or commercialization. This program is offered free of charge and purposed to assist small businesses achieve their SBIR/STTR Phase III goals.

The bottom line is that the SBIR/STTR program is embraced and fostered by the State of Florida and the Central Florida region where I reside and base my company. Our region is determined to diversify our economy through the growth of high-tech jobs and companies, therefore making the SBIR/STTR program an on-ramp for many entrepreneurs such as myself. I am fortunate to live in a region where I am encouraged, supported, and advised on how to grow our IP and our company into a sustainable proposition that will ensure the commercialization and transition of the technology developed under the SBIR contract we have been awarded.

At the same time, what has most ensured our success in the SBIR program has been the support and close collaboration with our Government customer at ARL-HRED ATSD. The Technology Manager that serves as my counterpart on the SBIR contract has provided us access to as much data and DoD SMEs to ensure the success of our project. This is an important and often overlooked attribute for the success of the program. Government employees should be encouraged and incentivized to invest the time required to ensure program success. We were afforded the opportunity to meet with stakeholders at the time we kicked off the project and continued to collaborate with them as a part of the development of the technology and usability studies. What

has worked for our team has been the access to Government personnel and resources that are relevant to the technology being developed in a timely fashion. Although the SBIR/STTR program is meant, among other things, to benefit the small business, it requires commitment from the Government team to provide access and much needed feedback as a part of the R&D process.

IMPACT OF THE SBIR AND STTR PROGRAMS AND WHAT STILL MERITS DEVELOPMENT

Since we are still into the early years of our SBIR journey, I would like to provide examples of two other companies that have been active SBIR and STTR program participants. Founded in 1995, Aptima, Inc. has been an active participant in the SBIR/STTR programs for the past 20 years. Examples of their success can be found in areas as diverse as pilot training, command and control, leadership instruction, user experience design, and cyber security. The common thread through all those areas: The human component. Aptima's focus has been on "human-centered engineering," in which methods and practice from the behavioral sciences is paired with cutting edge computer science (e.g., machine learning, artificial intelligence), software engineering, and military know how.

The goal of the SBIR/STTR programs is in part to support the growth of small businesses through commercialization and in part to provide the federal government with cutting edge technologies that help with the missions of various federal agencies through transition. Through successful collaboration with the United States Government and the Naval Air Warfare Center Training Systems Division (NAWCTSD) and their SBIR initiatives, Diamond Visionics developed and deployed new technology for the U.S. Navy P-3 and several other programs in support of our national defense. Diamond Visionics and the Genesis Family of software products have grown

through the technical innovation specifically sponsored through many SBIR awards. In total, they have received twenty-three (23) Phase I SBIR and fourteen (14) Phase II awards.

The dynamic construction engine in GenesisRTX is specifically designed to provide high-fidelity real-time visualization using GIS source data (including vector, model, imagery, classification, and elevation sources, including the United States Navy Portable Source Initiative (NPSI) by leveraging modern GPU architectures and multi-core processors commercially available on the market. The GenesisRTX technology eliminates the need for time-consuming and labor-intensive off-line database generation, while providing significantly higher fidelity than is typically possible using antiquated traditional approaches. The result is significant savings, while providing high-quality, high-performance 3D visualization constructed on-the-fly during run-time directly from the source data for a much lower cost and rapid turn-around times to support our nations warfighters.

Through successful collaboration with their U.S. Navy and U.S. Army counterparts, Diamond Visionics developed and deployed this new technology globally, which has allowed for modest revenue growth, local hiring and retention of their technical staff. In addition to full-time technical staff, Diamond Visionics have also employed nineteen (19) student internships over the years, seven (7) of which resulted in full-time employment with Diamond Visionics upon graduation from Binghamton University.

Aptima has worked hard to find success in both transition and commercialization. To support the commercialization goals of the SBIR/STTR programs, Aptima has developed a method of standing

up subsidiary businesses that take SBIR-developed technologies to new markets such as healthcare and educational technology. Similarly, Aptima has had made major efforts to transition technologies out of the SBIR programs and into operational use. Examples of this success includes the U.S. Air Force Distributed Common Ground System weapons System Trainer (DWST) and Confined Space Monitoring programs and the U.S. Navy P-8A program. For the P-8A effort, Aptima has added over $6.3M to a Navy Phase II SBIR project with $4.77M provided by from the Naval Air Warfare Center Training Systems Division (NAWCTSD) to enable diagnostic assessment and tracking of crew performance and readiness for P-8A aircrew.

The impact of the SBIR program on Aptima cannot be overstated. It is a main driver for growth and new innovation. The proof is in their recent projections for new hires; they anticipate 15% - 20% growth each year for the next three years, with much of that growth to occur in the Central Florida region. However, this growth could be even greater if there were more alignment between the SBIR topics and the larger acquisitions requirement process. Within the DoD, SBIR topics often describe technologies that are of interest to specific military agencies and offices but have not yet been incorporated into official requirements or the POM process. This becomes a challenge to the companies performing the SBIR activities because there may not be a ready contract for the new technologies to find continuing support after the Phase I and Phase II periods are over, even if there is agreement among military stakeholders that the technologies would be of significant benefit to our military service members.

Most companies with SBIR/STTR work often live under the threat of budget uncertainty and the Program Objective Memorandum (POM) process. There has been much written regarding how

Continuing Resolutions and the resulting unstable funding profiles affect force readiness. I would submit that this threat is especially felt by the small businesses performing this type of research. As small businesses, we cannot absorb the breaks in a program funding that often occur under these circumstances. It is nearly impossible to internally keep the project moving especially at the early stages of development

Additionally, there is often a disconnect between the SBIR/STTR pipeline of work and its maturation into the POM process. As the technology matures, Phase III funding decisions often require a fully-funded transition program represented in the POM. This practice fails to recognize the natural phasing of these efforts and often prevents relevant, innovative technologies from transitioning successfully. Currently there are no tangible incentives for the services' acquisition communities to transition technology as this often involves risk. In order to overcome this headwind, we have to change the way we view failure of some of these programs. We can choose to view the failures as the death knell of a program or as an opportunity to leverage all there is to learn and move forward to the next iteration.

CONCLUSION

In conclusion, I want to reiterate that not only as a participant, but as a taxpayer, I believe in the SBIR/STTR program. We are at a critical time in our Nation's history and it is now more imperative than ever to continue to be the World leader. A shift has occurred that puts at risk our ability to drive technological change and revolution. Progress is now determined by the new innovations we develop as much as by the ways in which we apply and how quickly we disseminate the advances. I hope that I have conveyed my personal experience with the SBIR and

STTR programs and how these experiences may represent other entrepreneurs in the high-tech sector. We find ourselves lagging as a nation in R&D when compared to other countries but we are also still as brilliant and agile as we have ever been. We have opportunities to expand and improve training, healthcare, communications, computation, cybersecurity and many other crucial technologies required to defend the freedoms we hold dear. This concludes my statement. Thank you for your attention and I look forward to answering any questions you may have.

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Testimony by Clinton T. Rubin, PhD,

Subcommittees on Contracting & Workforce and Research & Technology

May 4, 2017

Good morning, and thank you to Chairman Knight and Chairwoman Comstock, Ranking Members Murphy and Lipinski, and members of the Subcommittees on Contracting and Workforce, and Research & Technology, for inviting me to testify today regarding the impact that the NIH Research, Evaluation and Commercialization Hub (REACH) program has had to catalyze technology development, SBIR/STTR initiatives and company formation from within our University communities. It is also an honor to join colleagues from the Small Business community, who work so hard to build companies around innovation and technology, and who harness the SBIR programs so effectively.

My name is Clinton Rubin, and I am a SUNY Distinguished Professor & Chairman of the Department of Biomedical Engineering at Stony Brook University in New York. While I am, by most any measure, a dyed-in-the-wool academic whose research is targeted towards the treatment of osteoporosis, obesity and diabetes, I have devoted a significant portion of my professional career to fostering the translation of academic-based, biomedical innovation into the commercial sector where it can ultimately improve human health.

I have personally founded three biomedical-centric companies (Juvent, Exogen, Marodyne), one of which has gone public, and have experienced firsthand the challenges and frustrations of bringing academic-based innovation into the commercial sector; securing intellectual property and financing, attracting experienced management, and navigating regulatory pathways. While the SBIR/STTR programs are powerful programs designed to catalyze, augment and accelerate the growth of small companies and add value to the

technologies on which they are built, it is also critical to recognize that there is a huge, untapped reservoir of discovery based engineering and science within academic centers that could become a next generation therapeutic, diagnostic or medical device, but instead languishes in university labs because it lacks the "proof-of-concept" necessary to attract the interest of the commercial sector. I am here to discuss the NIH-REACH proof of concept centers as one such means of helping to drive federally-funded basic science into the commercial sector, accelerate the path to new treatments for disease, create high-value jobs, and foster bio-based company formation. Translating bio-based discoveries from the academic benchtop to the bedside to improve health must embrace the commercial sector, a goal which must attract the attention of the entire academic community. REACH has helped enormously to achieve that goal.

Please note, I also serve as the Director of the Long Island Bioscience Hub, one of the three, NIH-designated Research Evaluation and Commercialization Hubs (REACH), established in accordance with Section 5127 of the 2011 SBIR/STTR Reauthorization Act (P.L. 112-81). The Long Island Bioscience Hub (LIBH) represents a regional partnership between Stony Brook University, Brookhaven National Laboratory, Cold Spring Harbor Laboratory, and the Feinstein Institute at Northwell Health Systems. Our REACH hub, like the ones at the University of Minnesota and the University of Louisville, is devoted to translating biomedical discoveries made at these institutions into new therapies, diagnostics, medical devices and research tools, and building upon these discoveries as the foundation for new company formation.

While the REACH program is only two-years in existence, it has already had major impacts at our institutions, fostering new intellectual property, increasing credibility with the investor community, promoting a shift in the academic culture, attracting new licensing opportunities, and most importantly, catalyzing the formation of new companies – some of which have

successfully secured SBIR funding. Please note: REACH is a program that does not compete w/ small business, nor does it dilute a basic science mission of the university, but instead fuels the growth of the small business community around university centers, and drives science towards successful new treatments for disease. REACH is synergy, and REACH is a bridge.

We were fortunate to receive the NIH designation in large part due to our thirty plus-year history as a New York State Center for Advanced Technology in Medical Biotechnology. The "Center for Biotechnology," as we are commonly referred to, is a university-based economic development organization that capitalizes on the innovation capacity and infrastructure of NY State's research universities to drive economic growth. Based at Stony Brook University, the Center serves as the lead organization for the Long Island Bioscience Hub (NIH-REACH) mentioned above, providing a platform for expansion of the critical infrastructure necessary to develop university discoveries into potential commercial products. Over the course of the Center's history we have contributed to the development of dozens of commercial products and start-up companies, contributing more than $80M annually to the New York State economy. Not only are we driving the formation of companies past the starting line, we proactively guide these companies forward, through mentorship programs, investor partnering, follow-on funding, and access to university facilities and scientists who understand the bioscience industry.

In November of 2016, we were very fortunate to also receive an i6 Challenge award from the Economic Development Administration to provide early-stage companies and faculty with in-depth training to compete successfully for SBIR/STTR funding. A major objective of the award is to develop efficient mechanisms that will help faculty and early-stage management utilize SBIR/STTR funding to foster company formation and accelerate the development of academic innovations into products that providers can use in clinical practice.

Team mentorship of new entrepreneurs is also a key component of the strategy. We believe that programs such as REACH not only catalyze company formation, but create an innovative climate on campuses to drive entrepreneurship, creating the very ecosystem that will nurture the companies that vie for SBIR-type support... it is the beginning of growth, and the definition of sustainability of the tech sector. Research-intensive universities are supersaturated with promising technology, and just like rock-candy, placing a string in that solution... providing a structure such as REACH, catalyzes new company formation, framed around cutting edge technology. It is true that universities are powerful economic engines for their communities, both locally and globally. But more effectively rooting the research and the technology into our communities, and harnessing the potential of the university for the creation of therapeutics and diagnostics, is certain to make our world a better, healthier place.

I am hopeful that my experience as an academician, entrepreneur, and director of academic-based technology development initiatives, may shed some light on the opportunities and challenges that face your committees, in areas related to the SBIR/STTR program in general, and relative to the NIH REACH program in particular. REACH fuels technology discovery, development and translation into the commercial sector, while the SBIR program enables these technologies and companies to thrive.

Universities as Economic Engines

Major advances at the interface of medicine, biology, engineering, and the computational and physical sciences have positioned the 21st century to witness profound technological advances destined to vastly improve human healthcare.[1] Smart drugs that target specific organs and treat specific diseases.[2] Vaccines and vaccine delivery to reduce the spread of debilitating illnesses. Bio-interactive materials to accelerate the regeneration and healing of tissues.[3] Patient-

specific designer drugs with the potential to recognize an explicit genomic profile, and new medical devices which will permit early recognition of disease pathogenesis, improving diagnosis and treatment of crippling conditions. Such advances in biomedical science and engineering have far-reaching implications for our academic research enterprise, the characteristics of our industrial sector and its relationship to academia, and on human healthcare through the advent of translational medicine.

The National Institutes of Health (NIH) is the key driver of biomedical innovation. With an annual budget of more than $33B,[4] the federal government, through NIH (and not counting $B's of R&D investment by other federal agencies such as NASA, DOE, DOD, NSF, etc.) provides the scientific infrastructure of basic science and technology development for the future of biomedicine. Research universities within the United States have since played a critical role in generating the discoveries that have led to commercially-available technology with large societal impact. Drugs including ReoPro® (Stony Brook University) to prevent heart attacks, Remicade® (NYU) for the treatment of autoimmune diseases, Gleevec (Oregon Health & Science University), for the treatment of blood cancer, Enbrel for the treatment of rheumatoid arthritis,[6] and devices including the Pacemaker (University of Minnesota) to regulate heart rhythms, and the MRI (Stony Brook University) and CAT Scan (Georgetown University) for medical imaging,[7] all have their roots in academia, and all have transformed healthcare. But how to augment this translation of science into medicine?

According to the AUTM Licensing Survey: FY 2015, 879 new products were commercialized and 1,012 new companies launched by universities in 2015 (up 11% from 2014). Seventy-two percent of these new businesses remain in the home state of the institution from which they licensed the technology, offering a compelling economic development justification for supporting

commercialization activities. Yet university technology transfer offices, and university-based proof-of-concept centers like our own Center for Biotechnology, will acknowledge that these outcomes *represent but a small fraction of the innovation taking place at our nation's research universities.* Entrepreneurial faculty have the motivation and the know-how to protect their discoveries, but unfortunately they represent only a very small percent of the total faculty on campus. With only a small cohort of faculty recognizing the path to commercialization, only a fraction of the research in universities will lead to new biomedical products. The majority of potentially valuable discoveries remain unprotected and out of sight in academic laboratories across the country, representing a vastly untapped, and tremendously under-realized opportunity to impact human health and the economy. Programs such as REACH help foster cultural shifts in faculty, spurring patent disclosures, attention to applied science, attraction of investors and capital, and a goal of translating their research into the commercial sector. Programs such as REACH directly drive technology development (e.g., patents), fuel economic growth (e.g., royalty returns and leveraged funding), and create jobs (i.e., company formation).

Barriers to Commercialization

There are several issues that have impeded the ability to translate academic innovation into commercial opportunities that can improve human health and fuel economic growth. While many universities – including the LIBH partner institutions - benefit markedly from the income secured through the return of royalties, on closer inspection the great majority of these fees are derived from the licensing of an astoundingly few technologies. No mechanism currently exists to adequately bridge the gap between early stage discoveries common to research universities and the point in time when a commercial partner would reasonably be willing to license or invest in the next stages of technology development. As a result, the shelves of tech transfer offices

are stacked with high-risk, early-stage technologies that still lack proof-of-concept or any commercial context that would address the market, competitive landscape, regulatory pathway, or appropriate business models necessary to attract commercial interest. And remember, the intellectual property most typically comes from a select few faculty oriented towards that path, and is blind to the great majority of academics – and their science - who stand unaware of this opportunity. Programs such as REACH not only catalyze new companies, they shift awareness at Universities to recognize the importance of innovation and entrepreneurship to empower their science by translating it into the commercial sector.

In parallel with this academic frustration, the commercial sector, and in particular the pharmaceutical/biotech industry, is shifting its attention to the acquisition and development of later stage assets. The cost to bring a single drug to market is now estimated at $2.6B and has more than doubled in 10 years,[8] The cost incorporates the failure rate of drugs that begin, but do not successfully complete, the clinical trial process, and the lengthy regulatory approval process required to move a drug through the clinical trial process. Ninety-percent of drugs fail in clinical trials, and seventy-five percent of drug costs are related to this failure. It is estimated that just one out of five thousand compounds that begins the preclinical development stage will actually reach market.[9] As new drugs become more expensive to produce, pharmaceutical research dollars and investment capital have shifted away from support for early-stage innovations to the acquisition and development of later-stage, blockbuster drugs that hold promise for significant market returns. The path of discovery to market is changing in the biomedical arena, and the pipeline for new drugs and devices is thinning. Pharmaceutical and biotech companies are looking to the academic centers for the 'next big thing,' but the early stage nature of most academic technologies discourages investment.

Compounding these challenges is a cultural divide between the academic and commercial sectors. The culture of research universities is driven by a focus on basic science that expands our fundamental understanding of the world. The primary objective is the pursuit of knowledge for the sake of knowledge. Furthermore, the faculty tenure and promotion process is based upon the ability to publish basic research findings in highly regarded scientific journals like *Science, Cell* and *Nature*, and on securing funding from federal, state and private agencies to further basic research programs. There is no doubt that the basic science that is pursued with passion in academic centers represents the basis for next generation technologies, but there must be a means to move it into the commercial world. REACH provides that path, and creates that engine.

Not only is there a cultural divide between the goals of the basic research enterprise and the commercial sector, there is also a fundamental lack of knowledge and a skepticism by many faculty about the commercialization process. It is a missed opportunity: not only to form a company around a platform technology, but to bring a promising therapeutic, diagnostic or medical device into the real world where it can positively impact public health.

Bridging the Gap Between Discovery & Commercialization

The SBIR/STTR Reauthorization Act of 2011 recognized that this science represented a robust pool of next generation technologies, and authorized the NIH to provide funding, education, and resources to facilitate the conversion of NIH-funded basic science discoveries into commercial technology development opportunities and start-up companies. In March of 2015, the Long Island Bioscience Hub was awarded, following a highly competitive process, a designation as one of just three, Research, Evaluation, and Commercialization Hubs (REACH) in the country. The other two designated Hubs are at the University of Louisville and the University of Minnesota.

The REACH Hubs join the National Heart, Lung, Blood Institute's three, consortia-based, NIH Centers for Accelerated Innovation (NCAI), forming a network of proof-of-concept centers across the country focused on developing best practices for the translation of academic innovation into the commercial sector, and proactively establishing the means to bring basic biomedical science into the commercial realm. Collectively, the network represents the innovation capacity of more than thirty academic institutions, creating a critical mass of technologies capable of attracting the sustained interest of strategic partners and investors. While in existence for only a short time, the impact of these REACH Hubs and NCAI Centers is tangible and very real, with new intellectual property filings, new companies formed, some of which are now funded by the SBIR/STTR program. The impact is real, it is beneficial, and it is growing by the moment.

REACH & NCAI Impacts

While it is early in the context of biomedical product development to be expecting commercial outcomes, early indications are that the Hubs and Centers are having the desired impacts. Since their inception, the Centers and Hubs have evaluated more than 850 early technologies to determine their commercial potential, emphasizing that faculty at these intuitions are 'listening'. From this process, 144 projects have been selected for funding, creating a pipeline of therapeutic, diagnostic, device, and research technologies at various stages of development. It is important to note that the funding is in no way a surrogate for a 'research grant.' These are technology development programs, with very specific milestones (e.g., disclosures for IP, securing of industry or SBIR/STTR funding, formation of company). And in this short time, thirty-two of these technology development projects have been completed. Each has benefited from the industry style project management approach of the REACH Hubs,

and from the commercial expertise each Hub brings to bear through its close partnerships with industry. This approach has resulted in 11 companies formed, 17 licenses and option agreements executed, and $45 million in follow-on funding raised, including five SBIR/STTR awards being issued. The REACH and NCAI programs have caught the imagination of the university ecosystem, and a priority for the basic science brimming at our benchtops is becoming its translation into the commercial sector. THIS is a principal path by which our science can benefit health and society, can create companies and can create jobs. These are new programs, but their impact is very real.

Equally important, the Hubs and Centers are working side-by-side with faculty innovators and students, exposing them to commercialization strategies, applying milestone driven project management objectives to the technology development process, and engaging industry representatives and investors in all aspects of their activities. Not only has the expertise represented by the Hubs and NCAIs improved efficiency and the likelihood that these innovations will reach market, but it has taught the faculty inventors and their teams of students and postdocs how to stage-gate research toward development of an actual commercializable product. This hands on approach to helping faculty understand the commercialization process is augmented by the innovative NSF I-Corp curriculum, which has been tailored to support the biomedical technology development environment, and incorporated in the Hub's and Center's training programs. It is wonderful evidence of the power/synergy of federal agencies working together. Further, the Hubs and NCAIs thrive from the active collaboration with each other, from the partnership with the NIH and our federal partners including the US Patent and Trademark Office (USPTO), the Food & Drug Administration (FDA), the Centers for Medicare and

Medicaid Services (CMS), and Kaiser Permanente, and from our commercial partners in the investment community and established industry. This comprehensive hands-on, side-by-side teamwork approach to technology development has begun to fuel the entrepreneurial culture within our universities, eroding some of the resistance, and lack of understanding that has existed in the past, and has catalyzed a new era in bringing science to the marketplace, as a critical step in improving healthcare.

The Long Island Bioscience Hub (LIBH) Impacts

To help highlight the impact the Hubs and Centers can have on their individual communities, I would like to focus a bit on our own experience at the Long Island Bioscience Hub. The Long Island Bioscience Hub represents a true government, university, industry partnership. The $3 million investment made by the NIH in our Hub has allowed us to leverage an additional $6M from our institutional partners (Stony Brook University, Brookhaven National Laboratory, Cold Spring Harbor Laboratory, and the Feinstein Institute for Medical Research), NY's Empire State Development, and the Research Foundation of SUNY. Our industry colleagues, including such companies as Pfizer, Lilly, Novartis, GE, and Canon, and the investment community represented by Orbimed, Canaan Ventures, and Pappas Ventures, to name just a few, are providing invaluable guidance at the technology evaluation and early development stages, and are actively encouraged by the outstanding quality of the projects they are reviewing and the faculty they are mentoring. These industry experts serve on our Strategic Advisory Board, our External Review Board, as advisors on individual projects, and as mentors to our start-up companies. Whether they become commercial development partners remains to be seen, but their contributions to the community and enrichment of the ecosystem have been substantial, and their curiosity has turned into very real interest in the next steps of the program.

In terms of technology development here at LIBH, in two years we have funded 33 projects across thirteen different departments and four institutions. These projects represent an investment of $2.1 million, and have resulted in 8 patents filed, 2 license and 3 option agreements executed, with 3 additional option agreements in negotiation. Fifty-two SBIR/STTR applications have been submitted by small company clients of the Hub since its inception in March 2015, 5 of which are focused on the development of technologies that were actually funded by the Hub. Our i6 Challenge award, launched in December of 2016, has offered SBIR/STTR training to thirty companies, faculty members, and students, and resulted in 7 SBIR/STTR applications for the April 2017 deadline. We are also proud to say we launched our first company in January as a direct result of the i6 Challenge, and anticipate more will follow. A somewhat novel initiative of our Hub is our Bio-Entrepreneur-in-Residence (BEIR) initiative, which offers serial entrepreneurs milestone-based compensation to evaluate the intellectual property portfolios of our partner institutions for the sole purpose of identifying technology that will support company formation. With the LIBH's technology and business development staff serving as a virtual start up team, the BEIR is expected to launch a company and exit the program as CEO of a newco. So far 8 BEIRs have been retained and 11 companies started. These BEIRs are responsible for 11 of the 52 SBIR/STTR applications. A transformation of our region is unfolding, and it is driven by the translation of biomedical science into commercial ventures. REACH has seeded a transformation of how academic discovery reaches the bedside.

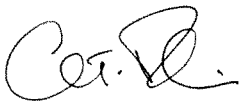
Conclusion

In summary, we have only begun to realize the potential of the NIH REACH/Long Island Bioscience Hub to transform our region into a vibrant, self-sustaining ecosystem that will fuel bioentrepreneurship and economic growth, to form companies to benefit the community, and

to develop technologies to improve health. It is early but our outcomes are real, our momentum is palpable, and exciting signs of a cultural shift within our partner institutions is evident. We are becoming a cornerstone of our region's and our state's economic development strategy, we are harnessing the exceptional basic science of our institutions towards new diagnostics and therapeutics, and the productivity and impact of our collaborative relationship within our partner institutions continues to grow. It would have been hard to anticipate the far-reaching impact the REACH investment has had on the Long Island Bioscience Hub, and we look forward to continuing to implement our shared vision with our federal, state, institutional, and industry partners.

Thank you again for your attention, and for the opportunity to testify. The REACH program, targeted to catalyze innovation, is innovation at its core. It is spawning technologies, fueling job growth, and catalyzing company formation. I urge you to consider reauthorizing it, and expanding its scope. I would be happy to answer any questions you may have.

Respectfully submitted:



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Question for the Record
Committee on Small Business, Subcommittee on Contracting and Workforce
Committee on Science, Space, and Technology, Subcommittee on Research and Technology
Improving the SBIR and STTR Programs
May 4, 2017
Responses by Joseph Shepard, Associate Administrator, Office of Investment & Innovation, SBA

Question from Rep. Eddie Bernice Johnson, Ranking Member Science Committee

1. **The Department of Energy recently informed its SBIR applicants that the Department is delaying notifications for awards that were to be announced on May 1st, seemingly unrelated to any uncertainties with Congress finalizing the fiscal year 2017 budget, which passed the first week of May. The FY 2018 "skinny budget" released in March stated that the budget "allows SBA to advocate and assist small businesses in accessing Federal contracts and small business research opportunities Government-wide." Please elaborate on the Administration's plans for the SBIR program currently and in the FY 2018 budget request. Specifically, please answer the following questions:**

   • Why was this announcement delayed?

SBA Response: SBA refers questions regarding DOE's FY 2017 Phase I and Phase II award announcements to DOE.

   • What is the process for allowing these awards to proceed?

SBA Response: SBA refers questions on DOE's specific review process to DOE.

   - **Does the Administration believe that the standard merit review process for awards from DOE's SBIR program is insufficient for award approval? If so, then how does the Administration plan to modify this process? If not, then have you examined the impacts on U.S. small business applicants of this delay? What are they?**

SBA Response: Section 7 of the SBIR Policy Directive provides general guidance on the agency review process, including the timelines for award notification and issuance. Aside from this guidance, SBA does not determine whether an agency's specific review process is sufficient for approval of an award.

• Are any other agencies putting a hold on awarding SBIR grants?

SBA Response: No other agencies have formally indicated they are putting a hold on issuing SBIR awards. However, in the past, when under a Continuing Resolution, agencies have held back SBIR funding until an appropriations bill is signed, which has and continues to cause delays of awards.

Question from Rep. Paul Tonko:

2. **The 2011 reauthorization allows NIH, DOD, and the Department of Education to conduct a pilot program to allow a small business to receive a Phase II award without having received a Phase I award, also known as the Direct to Phase II pilot. Some have expressed concerns that allowing companies to skip Phase I will shut out some small**

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businesses from competing for SBIR award funding. We discussed this issue during the hearing. Please elaborate on current agency use of Direct to Phase II awards and efforts to prevent marginalization of less established small businesses that go through the regular process.

SBA Response: During FY2012 – FY2017, according to 15 U.S.C. § 638(cc), the National Institutes of Health (NIH), Department of Defense (DoD), and Department of Education (DoEd) were allowed to issue Phase II awards to small business concerns that did not receive a Phase I award. NIH and DoD have used this authority, but DoEd has not. NIH began its Direct to Phase II Pilot in FY15 and uses the pilot to fund technologies in which the firm has already matured past the Phase I feasibility stage with their own resources and is ready for the Phase II demonstration stage. Navy began its Direct to Phase II Pilot in FY17, Air Force began its Direct to Phase II Pilot in FY16, and DARPA began its Direct to Phase II Pilot in FY14.

There has always been, and continues to be, a need to balance smaller Phase I awards for feasibility testing of innovative ideas with larger Phase II awards for further development to de-risk technology. However, there are times when an award recipient has proven the feasibility of a technology, and then moving directly to Phase II can accelerate commercialization of the technology in an effort to provide delivery to consumers and warfighters faster. SBA is aware of the concern that increased Direct to Phase II awards may result in agencies diverting SBIR funds away from Phase I awards, which may limit access to Phase I SBIR funding for companies with very early stage technologies. SBA supports agency efforts to manage their portfolios to maintain an appropriate balance of Phase I and regular Phase II award recipients.

Question from Rep. Daniel Lipinski, Ranking Member, Subcommittee on Research & Technology:

3. **The 2011 reauthorization required agencies to increase their efforts to help small businesses commercialize their technologies. What have the participating SBIR agencies done to meet this goal of increased commercialization at each phase of the SBIR program? What programs are in place and what money is spent during the pre-SBIR award phase (Phase 0), Phases 1 and 2, and the post-award phase (Phase 3)?**

SBA Response: A number of agencies used the 3% administrative funding pilot program, authorized at 15 U.S.C. § 638(mm), to increase support for commercialization efforts. Initially, programs focused on Phase II. However, it is common today for agencies to provide services in both Phase I and Phase II. Since the 2011 Reauthorization, agencies have used the 3% administrative funding pilot program to initiate Phase 0/pre-SBIR programs that support commercialization and outreach to improve the commercial potential of projects that may be funded by the SBIR/STTR programs. Specific Phase 0 programs include:

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- Department of Energy, which has a Phase 0 Proposal Assistance Pilot Program that provides market research assistance, intellectual property consulting, and small business development training and mentoring, in addition to proposal preparation assistance for companies that have been typically underrepresented, such as women-owned or minority-owned small businesses and firms located in underrepresented states, districts, and territories.
- National Institutes of Health Phase 0 Proof-of-Concept center (REACH/NCAI), which receives support from Entrepreneurs-In-Residence to provide advisory services to academic innovators.
- U.S. Department of Agriculture I-FAST (Innovations in Food and Agricultural Science and Technology) prize competition, which supports entrepreneurship training to academic innovators through the NSF I-Corps program.

The I-Corps curriculum has also been offered to Phase I SBIR/STTR awardees through the NSF Beat-the-Odds Bootcamp program and the HHS I-Corps at NIH program. NIH has also offered entrepreneurship training to Phase I awardees developing medical devices and diagnostics through the Concept to Clinic: Commercializing Innovation (C3i) program, formerly known as the Coulter College for Commercializing Innovation program.

HHS and NSF have also used 3% administrative funding to provide over 400 Phase I and Phase II awardees a platform to showcase SBIR/STTR funded innovations and partner with potential customers and follow-on investors at international conferences, including the Biotechnology Industry Organization (BIO) and Consumer Electronics Show (CES) meetings.

The DoD Velociter program also supports Phase I and Phase II awardees by providing entrepreneurial training, mentorship, and engagement with potential end users, customers, or investors.

Specific Phase 2-awardee focused programs include the Civilian Commercialization Readiness Pilot Programs implemented at HHS, DHS, NASA, and NIST and the Navy Forum for SBIR/STTR Transition (FST), which provides Phase II awardees mentoring and a marketplace to match DON needs with SBIR/STTR solutions.

The size of the awards for the commercialization programs vary depending upon the scale of the program and the objectives. A small program may contain 15 participants; while a large program may contain 400 participants. The maximum award amount made available for commercialization assistance programs through the discretionary technical assistance authorized at 15 U.S.C. § 638(q) is $5,000 per awardee per year for each Phase I and Phase II award.

The goal of all Phase II support programs is to help the firm reach commercialization or Phase III. The 2011 Reauthorization also authorized DoD and civilian agencies to provide additional funding to companies with promising technologies for commercialization.

Question for the Record
Committee on Small Business, Subcommittee on Contracting and Workforce
Committee on Science, Space, and Technology, Subcommittee on Research and Technology
Improving the SBIR and STTR Programs
May 4, 2017
Responses by Joseph Shepard, Associate Administrator, Office of Investment & Innovation, SBA

The DoD Commercialization Readiness Program (CRP) has enabled DoD to accelerate the transition of technologies, products, and services developed under Phase III, including the acquisition process.

Civilian agencies may participate in the Commercialization Readiness Pilot Program for Civilian Agencies which has allowed participating agencies to provide up to 10% of its funds allocated to SBIR for: (i) follow on awards to small businesses for technology development, testing, evaluation, and commercialization assistance for SBIR or STTR Phase II technologies; or (ii) awards to small businesses to support the progress of research, research and development, and commercialization conducted under the SBIR or STTR programs to Phase III.

4. **The 2011 Reauthorization gave NIH authority to conduct a pilot on proof-of-concept activities, which in part led to the Research Evaluation and Commercialization Hubs (REACH) and the NIH Centers for Accelerated Innovations (NCAI). During the second panel of the hearing, Dr. Rubin described that only up to two to three percent of university research is ever explored for commercialization potential. He also stated that several of the projects funded by the Long Island Bioscience Hub have received SBIR funding and has resulted in several companies being formed. Please describe any preliminary successes or challenges from the other two REACH pilot programs.**

SBA Response: In addition to the Long Island Bioscience Hub, the other two REACH pilot proof-of-concept centers are the University of Louisville ExCITE Hub and the University of Minnesota MN-REACH. The Director of the NIH is identified in the 2011 Reauthorization as the responsible party for the evaluative report on the program. Therefore, this question may best be addressed directly by the NIH, which is part of the Department of Health and Human Services (HHS).

COMMITTEE ON
SCIENCE, SPACE, & TECHNOLOGY
Lamar Smith, Chairman

For Immediate Release
May 04, 2017

Media Contact: Kristina Baum
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Statement of Research and Technology Subcommittee Chairwoman Barbara Comstock (R-Va.)

Improving the Small Business Innovation Research and Small Business Technology Transfer Programs

Chairwoman Comstock: America's future economic and national security depends on global leadership in key areas of science and technology.

Basic research supported with taxpayer dollars through the National Science Foundation, NASA, NIH, DOD, and other federal agencies underpins the key scientific discoveries that have created today's world: the internet, wireless communications, life-saving medicines, lasers, and more.

At the horizons of basic research are breakthroughs in new fields like quantum computing, artificial intelligence, and bioengineering, breakthroughs that will continue to transform our lives and the world we live in.

If basic research produces the scientific feedstock for innovation, risk-taking small businesses are the catalysts for converting knowledge into new products and services. They are the catalysts for economic growth, for producing the family and community sustaining jobs that we need so badly.

Congress enacted the Small Business Innovation Research, or SBIR, program in 1982, followed by the Small Business Technology Transfer, or STTR program in 1992.

These two programs accelerate technological innovation and commercialization of new products and services by small businesses. They also help the Department of Defense and other federal agencies meet their research and development needs.

Federal agencies with extramural research budgets of $100 million or more per year, offer assistance through the SBIR program. They are required to allocate 3.2 percent of their extramural research budgets for competitive grants to small businesses, grants that underwrite the businesses' technology development and commercialization initiatives.

The five federal agencies with extramural research budgets of at least $1 billion or more per year comprise the STTR program. These agencies allocate an additional 0.45 percent of their budgets for STTR grants.

Although these sound like small percentages, the total dollar numbers are huge. Since Congress first authorized these programs, participating federal agencies have awarded more than $40 billion to small businesses.

This is a huge cumulative taxpayer investment. And this continuing investment and the programs' potential to stimulate needed economic growth make it particularly important for Congress to assure the programs are being administered efficiently and effectively.

There are many small business success stories in which SBIR and STTR assistance have played a key part. Among the thousands of small companies and start-ups that have used SBIR and STTR to bootstrap their growth are dozens in my Northern Virginia district.

These include:

- **3 Phoenix**, an engineering small business in Chantilly, Virginia that uses SBIR assistance to create innovative electronic technology solutions to the Department of Defense and the US Navy, as well as private industry. The CEO of 3 Phoenix, Inc. testified before our Subcommittee last year.

- **Mosaic ATM**, a Leesburg enterprise that has used SBIR to improve air transportation efficiency and safety and push the envelope on unmanned aircraft systems.

- **Vidrio Technologies**, an Ashburn small business commercializing neuro-imaging tools and microscopes to provide a better "window into the brain."

- **Progeny Systems** of Manassas, Virginia has leveraged both SBIR and STTR assistance to develop specialized software and hardware system integration capabilities, computer-vision solutions, and cutting-edge research and development for advanced manufacturing.

- And **Aurora Flight Sciences** of Manassas, Virginia, a global leader in advanced unmanned systems and aerospace vehicles for NASA and other government agencies and private concerns. I'll be introducing Aurora's CEO to the Subcommittee shortly as an expert witness for today's hearing.

One of the most important accomplishments of the last Congress was timely reauthorization of SBIR and STTR. Continuity is crucial for affected small enterprises, and I am proud that Congress acted to extend the programs through Fiscal Year 2022.

The next step, which is the subject of today's hearing, is considering what Congress can do to strengthen the programs.

- What program updates are needed to spur accelerate conversion of basic science into innovative products and solutions?

- What adjustments are needed to maximize the return on investment for taxpayers?
- What reforms would help agencies and their IGs detect and prevent fraud and abuse.

I look forward to hearing our expert witnesses address these questions.

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Opening Statement

Rep. Eddie Bernice Johnson (D-TX)
Ranking Member
House Committee on Science, Space, and Technology

"Improving the Small Business Innovation Research and
Small Business Technology Transfer Programs"
May 4, 2017

I would like to thank the Chairs and Ranking Members for holding today's hearing to examine the status of the SBIR and STTR programs and to consider further improvements to the programs. I look forward to working with my colleagues on the Science Committee and on the Small Business Committee to ensure that any legislation that might move forward maximizes the benefits of federally funded small business R&D.

The spirit of American innovation is undiminished, and the Federal R&D enterprise supports innovation by funding the best and brightest at our great research institutions and by creating opportunities to leverage private sector investment. The SBIR program plays an important role in supporting the small business community's ability to contribute to the federal science agency missions.

That said, we should continue to explore smart ways to further leverage small business R&D to help meet federal research and mission needs. Changes to the SBIR and STTR programs made in the 2011 reauthorization were intended to make it easier for small businesses to navigate the program and to make the program more efficient. This hearing will examine how agencies have implemented the new requirements and flexibilities introduced in the last law and whether the programs are achieving their goals. In addition, one particular topic that I hope the witnesses can address this morning is the status of efforts to increase participation by women and minority. For decades I have been advocating for policies to spur increased participation in the STEM fields by these groups, and I continue to be frustrated that we haven't seen more growth. We need to do better in both our education system and in the private sector.

Finally, with regard to funding, the SBIR program has grown 30 percent since the 2011 reauthorization, while the overall federal R&D budget has remained essentially flat. Today, federal agencies set aside $2.2 billion each year from the federal research and development budget to fund the SBIR and STTR programs. Stability and continuity in the SBIR and STTR programs are important goals, which is why I supported the agreement in last December's National Defense Authorization Act (NDAA) to extend the program until FY 2022 at the current year's levels. I believe it is appropriate that we leave that agreement standing even as we

consider policy changes and updates at today's hearing. The Science Committee's duty is to help ensure that the R&D enterprise as a whole is healthy and sustainable, and I think that a good way to support continued growth of SBIR is by continuing to grow our overall investment in research and development.

In closing, I want to express my appreciation to our witnesses for being here today, and I look forward to their comments and recommendations.

With that, I yield bank the balance of my time.

OPENING STATEMENT
Ranking Member Dan Lipinski (D-IL)
of the Subcommittee on Research and Technology

House Committee on Science, Space, and Technology
Subcommittee on Research and Technology
"Improving the Small Business Innovation Research and Small Business Technology Transfer Programs"
May 4, 2017

Thank you Chairman Knight, Chairwoman Comstock, and Ranking Member Murphy for holding this hearing to consider improvements to SBIR and STTR, programs that help small business innovators turn their ideas into market-ready products. I support strong investment in basic research at our nation's universities and federal labs, and I also support innovative and scalable policies and programs that help move this taxpayer-funded research out of the lab for commercial and societal benefit. The SBIR and STTR programs engage innovative small businesses in the Federal R&D system and play an important role in technology transfer. We need to do what we can to make these programs work even better, because America's economic development and job growth depend on these small business innovators.

Eleven federal agencies invest a total of $2 billion annually in the SBIR and STTR programs. These programs are a critical source of early-stage R&D financing. They give small businesses access to non-dilutive capital for validation of their ideas, product development, and testing, which often leads to follow-on private-sector funding and market introduction.

Commercialization is one of the ultimate objectives of the SBIR program. In last year's assessment of the SBIR and STTR programs, the National Academy of Sciences found that about half of all the programs' awardees generated commercial sales, and in a survey of NIH awardees, about 27 percent of the respondents had sales in excess of $1 million.

SBIR is funded as a carve-out from funding for basic research, including research carried out by many of the same innovators who eventually apply for SBIR funding. Unfortunately, for the most part the overall pot of research money is not growing even as the SBIR program has grown by 30 percent since 2011. We must continue to be sensitive to this balance between funding for the pipeline of talent and basic research that feeds the ideas that an entrepreneur may eventually commercialize, and funding directly to the entrepreneurial activity itself.

Recent assessments of the SBIR program have provided us with good ideas on how to make the program more efficient and better able to achieve its goal of commercializing new products and services. A great proven example of this is the Innovation Corps Program, also known as I-Corps. I-Corps provides entrepreneurial education and other early stage support for innovators. NSF launched I-Corps in 2011 and it has since spread to other agencies, including DOE, NIH, DOD, USDA, and others. Early returns show that entrepreneurs who go through this program are more successful in their SBIR applications than those who do not. I-Corps and SBIR go hand in hand to strengthen the Federal R&D ecosystem that connects research institutions and industry.

I believe we need to expand on the success of I-Corps by making entrepreneurial education a central pillar of the SBIR program. We need to expand access to I-Corps so that it is available to SBIR grantees from every agency. We also need to spread the I-Corps model of entrepreneurial education throughout all phases of the SBIR cycle. Just as participating in I-Corps prior to applying for a Phase 1 grant can increase a researcher's success rate, participating in a startup accelerator that mentors innovators and teaches them how to scale their companies can increase their chances of commercial success. There are many examples of successful accelerators already operating, such as Y Combinator in Silicon Valley or the New Venture Challenge at the University of Chicago. The SBIR program should adopt a proven accelerator model for Phase 2 grantees.

In addition to entrepreneurial education, innovators often need funding for proof-of-concept work prior to applying for an SBIR grant. In the 2011 SBIR Reauthorization, I sponsored a provision to create a Phase 0 pilot program at the NIH. The Phase 0 Proof of Concept Partnership Pilot Program utilizes a small portion of the funds from within STTR. The NIH Centers for Accelerated Innovations and the Research Evaluation and Commercialization Hubs, or REACH, programs are funded by this pilot program. I look forward to hearing from Dr. Rubin about the REACH center that he directs at Stony Brook University. Relatively small investments by agencies in all aspects of pre-SBIR education and innovation could significantly improve commercialization outcomes for the SBIR program and for federally funded research more broadly.

Beyond commercialization, there are several other significant issues that I know our Federal witnesses will address this morning. We will hear from Mr. Neumann about ways to better guard against fraud, waste, and abuse in the SBIR program. The 2011 SBIR authorization included provisions to improve agencies' flexibility in making awards to small businesses, provide funding for outreach activities and other administrative issues, and increase data reporting. I look forward to an update from Mr. Shepard on how the agencies have implemented these new requirements, as well as feedback from the small business witnesses on what they believe has worked and what still needs improvement. Your testimony is important and helps us determine what to address as we work on additional policy improvements for the SBIR program. I look forward to working with my colleagues on both Committees to continue updating and strengthening the SBIR and STTR programs.

Thank you and I yield back the balance of my time.

COMMITTEE ON
SCIENCE, SPACE, & TECHNOLOGY
Lamar Smith, Chairman

For Immediate Release
May 04, 2017

Media Contact: Kristina Baum
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Statement of Chairman Lamar Smith (R-Texas)
Improving the Small Business Innovation Research and Small Business Technology Transfer Programs

Chairman Smith: Thank you Chairman Chabot, Chairman Knight, and Chairwoman Comstock for holding this joint hearing.

President Reagan agreed to start the Small Business Innovation Research program, or SBIR, in 1982 to help spur innovation and increase small business participation in federal research and development activity. In Fiscal Year 1983, $45 million was "set-aside" from Federal R&D for this purpose.

Since then, more than 100,000 U.S. small businesses have received SBIR grants with the goal of converting taxpayer-supported basic research discoveries into commercial innovation.

Today, that initial $45 million redirection of Federal R&D has grown to approximately $2.5 billion annually.

Congress approved the Small Business Technology Transfer program, or STTR, in 1992. STTR requires collaboration between a small business and a non-profit research institution to bridge the gap between fundamental science and commercialization.

SBIR and STTR companies have created parts for NASA's Mars Rover, equipped our military men and women with key war-fighting innovations, and generated a long list of life-saving medicines and health care treatments.

Many small businesses in my home district have received SBIR and STTR support.

SBIR support helped Applied Nanotech of Austin, TX, to become a world leader in efficient solar energy cells, new materials for blast-resistant structures and equipment, and low-cost, high performance metallic inks and pastes for ink-jet-printed electronics.

Xeris Pharmaceuticals, also Austin-based, used SBIR funds to develop new delivery systems for injectable medicines that aren't soluble with water. This innovation helps thousands of infants and young children afflicted with Congenital Hyperinsulinism.

As a result of cooperation between the House Armed Services, Small Business, and Science, Space, and Technology Committees at the end of last year, Congress reauthorized the SBIR and STTR programs through Fiscal Year 2022.

This timely action provided certainty and disciplined direction for the participating Federal agencies to continue to manage the program.

Today's hearing is the next legislative step – program oversight and evaluation of a new Government Accountability Office (GAO) report on waste, fraud and abuse in the two programs.

Both SBIR and STTR receive all of their funding from federal agencies' research budgets.

SBIR began with a deduction of 0.2 percent from agencies' research budgets. Today, the SBIR allocation from basic research is 3.2 percent, or 16 times higher. Eleven federal agencies with research budgets of $100 million or more are currently subject to the SBIR funding "tax."

Five Federal agencies with annual external research budgets of more than $1 billion are also required to provide funding for the STTR program, which amounts to 0.45 percent from the agencies' annual research funding.

These two levies from basic research currently amount to approximately $3 billion each year.

This is a significant diversion at a time when U.S. research and development leadership is under challenge.

Projections have China overtaking the US in R&D spending as soon as 2020. Innovations developed from publicly supported scientific breakthroughs create new industries, new businesses, and new jobs that continue to transform our lives and our society.

Our future economic and national security depends on our leadership at the leading edges of key areas like quantum physics and bioengineering.

SBIR/STTR waste, fraud and abuse hurts other, deserving small businesses. It also means there will be no payoff from funds taken away from scientific research.

According to the GAO report that will be presented this morning, the Small Business Administration has a track record of failing to implement GAO recommendations.

Under the previous administration, SBA either ignored or proved itself to be incapable of implementing GAO recommendations aimed at improving program administration and reporting by funding agencies.

Of special concern among SBA failures has been its inability or unwillingness to implement GAO-recommended actions to protect taxpayers against SBIR/STTR waste and fraud.

Moreover, under the previous administration, SBA decided to withhold information from Congress that it is required by law to provide. SBA has not submitted a required annual report to Congress since Fiscal Year 2013.

There are two important, tangible goals for today's hearing.

First, our Committees can jointly develop legislation that updates the SBIR and STTR programs and requires transparency and accountability from federal agencies for their efforts to prevent fraud and abuse.

Second, our Committees should work together, through oversight hearings and, if necessary, investigations, to hold individual federal agencies and their leaders accountable for compliance and performance to combat waste, fraud and abuse.

Although the large majority of SBIR and STTR grants to small businesses are put to work appropriately and effectively, we must assure that not a single tax dollar is wasted.

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